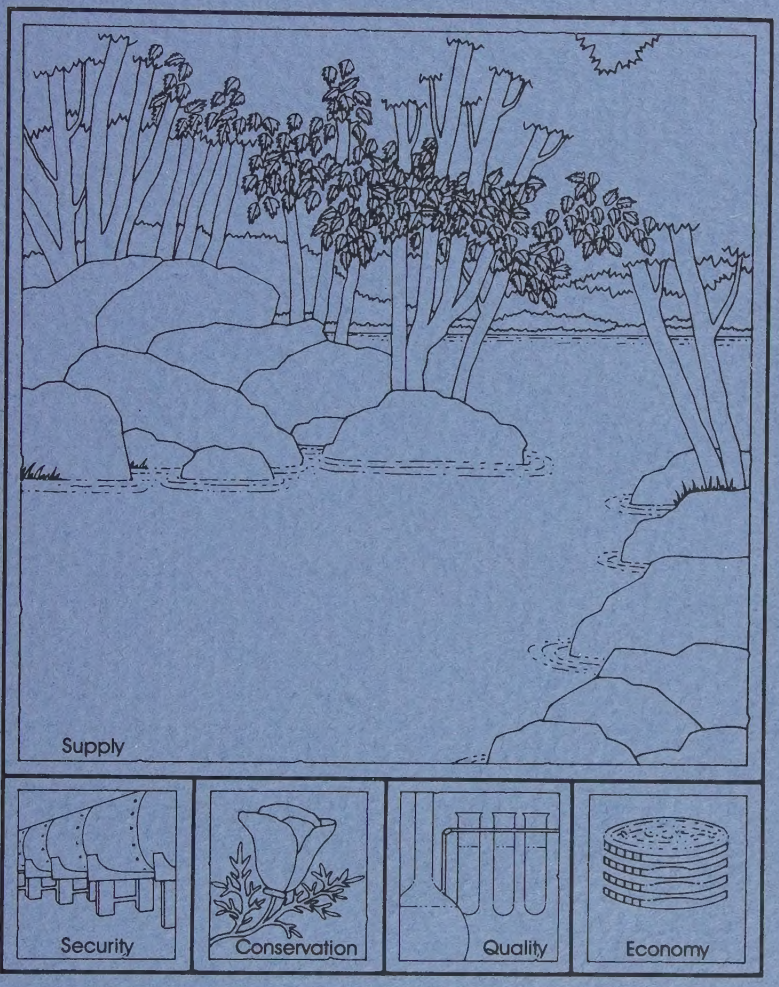
URBAN WATER MANAGEMENT PLAN



November 1985

East Bay Municipal Utility District

EBMUD

URBAN
WATER MANAGEMENT
PLAN

EAST BAY MUNICIPAL UTILITY DISTRICT

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PREFACE

On November 26, 1985, after a period of public review and a public hearing, the EBMUD Board of Directors adopted this Urban Water Management Plan in compliance with the Urban Water Management Planning Act (AB797).

The expanded Water Conservation Program described in Chapter VI provides the framework for developing implementation details for an effective and equitable program. That next step will include preparation of procedures, rules, and regulations to carry out the program, including further analysis of some conservation alternatives. Public review will be part of the continuing process.

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Introduction

WATER ACTION PLAN

The East Bay Municipal Utility District (EBMUD) is developing a Water Action Plan scheduled to be completed in draft form in 1986. When adopted, the plan will establish the courses of action EBMUD intends to follow to meet its water supply needs. The District will be structuring the strategies and projects in the proposed plan to assure that EBMUD will have a secure water supply of the highest quality and of sufficient quantity to meet the water demand projected for the future.

The development of the Water Action Plan requires evaluation of the factors that may influence projected water demand, particularly water conservation. A principal objective is to establish an expanded water conservation program for improving the efficiency of water use by EBMUD customers. This document, the Urban Water Management Plan (Plan), covers these elements and will provide input to preparation of the Water Action Plan.

URBAN WATER MANAGEMENT PLANNING ACT

In addition to providing information for EBMUD's Water Action Plan, this Urban Water Management Plan satisfies the requirements of the Urban Water Management Planning Act (Act). The Act became part of the California Water Code with the passage of AB 797 in the 1983-1984 Regular Session of the California Legislature. Appendix A contains the text of the Act. The Act recognizes that water is a limited and renewable resource subject to ever-increasing demands, and that conservation and efficient use of urban water supplies is a state-wide concern. The Act also recognizes that planning for efficient use and implementation of those plans can best be accomplished at the local level. The Act requires every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt an Urban Water Management Plan by December 31, 1985. The Plan must be submitted to the California Department of Water Resources within 30 days after adoption. The State's policy, declared in the Act, is to achieve conservation and efficient use of urban water supplies to protect both the people of the State and their water resources.

Section 10631 of the Act requires that the Plan include specific elements related to conservation and efficient use of water. These elements are described further in the Report Format section below.

Sections 10632 and 10633 of the Act require that an Urban Water Management Plan include the evaluation of a number of additional factors if the Plan projects a future water use that shows a need for an expanded water supply. EBMUD's Mokelumne River system is occasionally subject to operational limitations. For that reason, the Plan includes the additional evaluation of those factors under sections 10632 and 10633 of the Act

as they may apply to EBMUD's situation. The operational limitations mentioned above could be improved by using the supplemental water supply EBMUD has under its existing contract with the U.S. Bureau of Reclamation. The need, timing, alternatives, and projects related to that supplemental supply are under study, however, and are not addressed in this Plan. They will be covered by the comprehensive Water Action Plan.

Public Review

Section 10642 of the Act requires urban water suppliers to make the Plan available for public inspection and hold a public hearing prior to adopting the Plan. Approximately 1000 copies of the Draft Plan were distributed for review and comment beginning on October 15, 1985. A public hearing was held on October 29 and written comments received through November 11. This Plan has been modified, where appropriate, to incorporate comments received from the public, interested organizations, and other agencies. Appendix B contains a summary of the comments received and EBMUD's response to those comments.

REPORT FORMAT

Chapter II of this Plan summarizes the information contained in the subsequent chapters. The next four chapters respond to Sections 10631(a) through (e) of the Act as follows:

- Chapter III — Water Use: Past, present, and projected water use segregated by category of use (10631[a]).
- Chapter IV — Water Supply Availability and Deficiency: Frequency and magnitude of supply deficiencies, including conditions of drought and emergency and the ability to meet short-term deficiencies (10631[e]).
- Chapter V — Current Water Conservation Program: Conservation measures currently adopted and being practiced (10631[b]).
- Chapter VI — Expanded Water Conservation Program: Additional conservation measures that would improve the efficiency of water use, including an evaluation of their impacts and a schedule of implementation (10631[c] and [d]).

The following evaluations required by Section 10632 are covered in Chapters V and VI:

- Wastewater reclamation (10632[a]).
- Management of water system pressures and peak demands (10632[c]).
- Incentives to alter water use practices, including fixture and appliance retrofit programs (10632[d]).
- Public information and educational programs to promote wise use and eliminate waste (10632[e]).
- Changes in pricing, rate structures, and regulations (10632[f]).

The evaluation of exchanges or transfer of water on a short-term or long-term basis (10632[b]) is discussed in Chapter III. Chapter VI presents the evaluation of alternative water management practices as required by Section 10633.

Chapter II
Summary

The East Bay Municipal Utility District (EBMUD) delivers water to over one million people in its service area, which covers portions of Alameda and Contra Costa counties; see Figure II-1. Currently, EBMUD is preparing a long-term plan, the Water Action Plan, to enable the District to continue serving its customers a safe and reliable water supply to the year 2020 and beyond. The Water Action Plan will include strategies and projects for:

- Anticipating the future water requirements of customers and actively pursuing the efficient use of water supplies through water conservation.
- Assuring that water supplies are of the highest quality.
- Providing improvements in the delivery of the water supply to the distribution system that are necessary to serve all customers reliably.
- Protecting the Mokelumne River supply against potential interruption due to flooding or earthquake damage of the aqueducts in the Sacramento-San Joaquin Delta.
- Evaluating alternatives to and providing the facilities for delivering the District's water supply from the Folsom South Canal as contracted for with the U. S. Bureau of Reclamation (USBR).

Water Action Plan will be supported by several documents including the Urban Water Management Plan (Plan) which addresses the future water requirements of the District and describes the Water Conservation Program intended to assure the efficient use of water supplies.

The programs and information described in the Plan and summarized in this chapter are collectively EBMUD's Urban Water Management Plan. In addition to being an important component of the Water Action Plan, the Urban Water Management Plan also satisfies the requirements of California's Urban Water Management Planning Act (AB 797).

WATER DEMAND

When EBMUD began water service in 1929, it served a population of about 440,000 in a service area of 92.6 square miles. In 1985, the population served is 1.1 million in a 311-square-mile area that includes 20 cities and 15 unincorporated communities. The average daily consumption in 1984 was 216 million gallons per day (MGD). The demand is expected to increase gradually in the future.

Figure II-2 shows past and projected water demands. Future water demand is shown as a range because it depends on a number of factors that are difficult to predict. The health of the economy, weather, and customer's response to EBMUD's water conservation programs are among the factors that affect future use of water. Water requirements are the gross quantities of water that must be supplied to meet the demand. Of the two projections shown, one is the probable

Service Area

Figure II-1

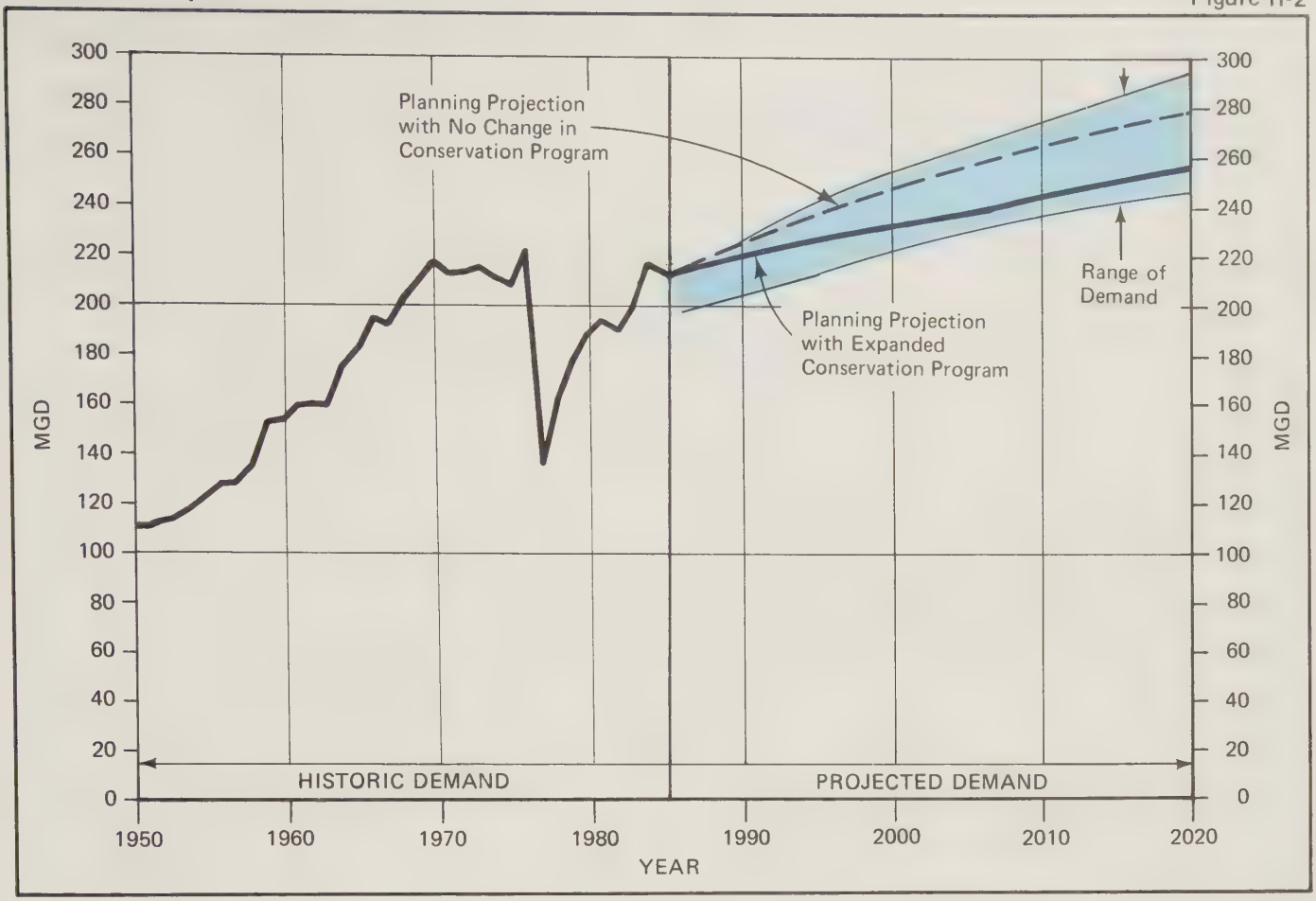
level of future water requirements if the conservation program remains unchanged; the other is a projection of future water requirements if the expanded conservation program is successfully implemented.

AVAILABLE WATER SUPPLY AND DEFICIENCY

EBMUD has a legal entitlement of up to 325 MGD from the Mokelumne River and an additional supply of up to 10 MGD from local runoff into terminal reservoirs in the service area. In extremely dry periods the Mokelumne basin may not produce sufficient runoff for the District to be

Water Requirements

Figure II-2



able to divert enough water to meet the demand. Also, the terminal reservoirs produce no net local yield in dry years because runoff is less than evaporation.

EBMUD is entitled to 134 MGD of American River River water from the Folsom South Canal under its contract with the U.S. Bureau of Reclamation that was executed in 1970. However, the EBMUD facilities to deliver that supplemental water supply have not been constructed.

In May 1985, EBMUD adopted a Policy on Water Supply Availability and Deficiency that established criteria and a procedure for annual evaluation of the adequacy of the District's water supplies. The criteria and procedure are used to determine the adequacy of:

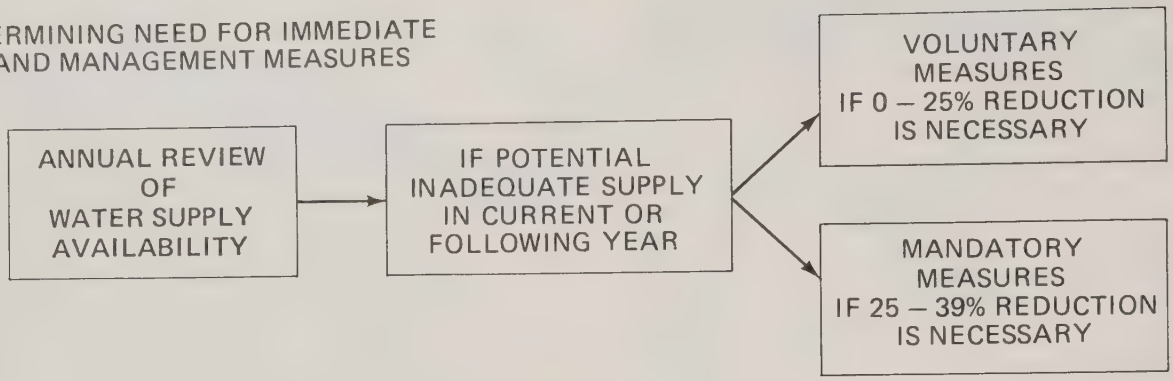
- Water supply available to meet customer demand in the current and following year.
- Water supply available for long-term demand.
- Water supply that might be available for requests of service beyond the ultimate boundary.

One of the policy's criteria provides that the deficiency to the average customer in a repeat of the 1976-77 drought should be no greater than the percentage reduction in water use actually experienced during the period of rationing in 1977 (39 percent). On that basis, the delivery of water from the Mokelumne River should be limited to serving an annual average demand of 240 MGD. Any higher level of demand in normal years would result in having to take a deficiency greater than 39 percent in a repeat of 1976-77 conditions. This limit will be reviewed annually and would increase when the contracted supply from the Folsom South Canal is implemented. Figure II-3 shows examples of measures that may be taken to meet requirements of the policy during short-term deficiencies caused by drought or other emergencies

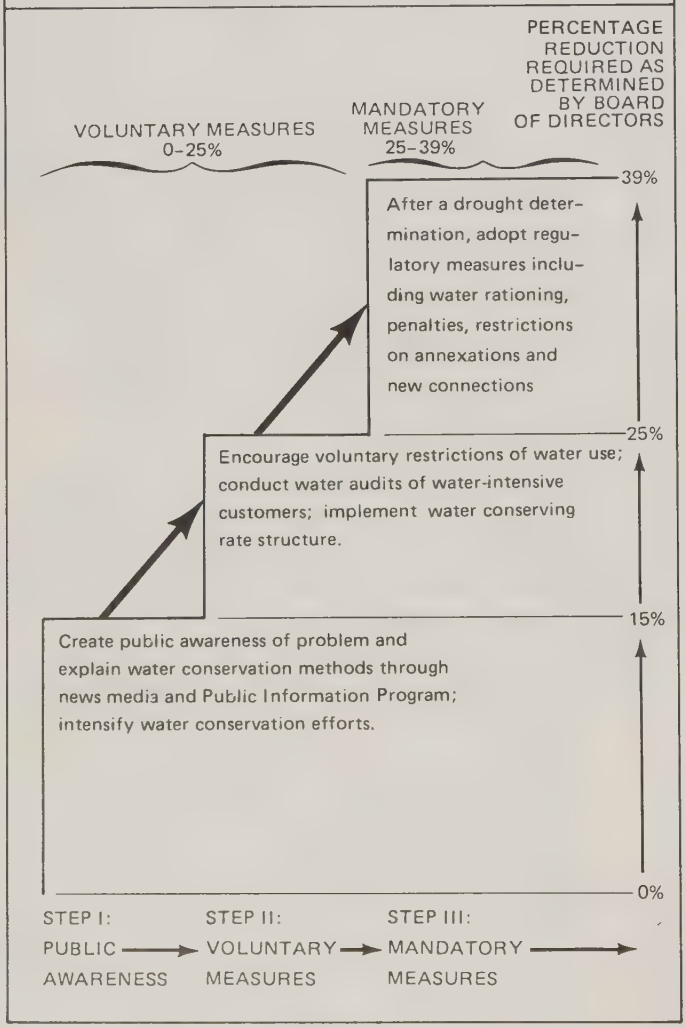
Short-Term Measures for Reducing Demand

Figure II-3

DETERMINING NEED FOR IMMEDIATE DEMAND MANAGEMENT MEASURES



PHASES FOR SHORT-TERM DEMAND MANAGEMENT



POTENTIAL MEASURES FOR SHORT-TERM DEMAND MANAGEMENT

MEASURES	PERCENT REDUCTION REQUIRED		
	0–15%	15–25%	25–39%
VOLUNTARY:			
1) Explain problem and objectives to media and public through press release, and news conference.	●	●	●
2) Intensify public information program.	●	●	●
3) Intensify water conservation efforts including incentive measures.	●	●	●
4) Promote voluntary program for limited outside water use.		●	●
5) Expand water audits of water-intensive customers.		●	●
6) Send letters to customers requesting conservation.		●	●
7) Change rate structure to encourage conservation.		●	●
MANDATORY:			
8) Implement water rationing program			●
9) Assess penalties for excessive water use.			●
10) Prohibit new annexations			●
11) Prohibit new connections			●

creating a shortage in supply. Similar measures, except for a prohibition on new connections, were successfully implemented in 1977 to reduce demand by 39 percent.

PRESENT WATER CONSERVATION PROGRAM

EBMUD's present water conservation program is aimed at encouraging all water and energy uses within the District to be efficient and avoid

Current Water Conservation Program

Table II-1

DEMAND MANAGEMENT ELEMENTS	
I SCHOOL EDUCATION	
Elementary Schools	In-school education program for kindergarten through eighth grades to teach wise water use. Program involves use of four different booklets.
High Schools	In-school education program for ninth through twelfth grades, which includes reading material and oral presentations.
II PUBLIC INFORMATION	
Demonstration Gardens	Three residential gardens with low-water-using landscaping to demonstrate their attractiveness and water-saving characteristics.
Resource Garden	Low-water-use landscaping at a city park that also uses a soil amendment obtained from the District's wastewater treatment process.
Speakers Bureau	Regular presentations on water conservation at community organizations.
Bill Inserts	Mailing of information on water conservation to District customers 2–3 times a year.
Brochures, Posters, Exhibits	Water conservation information available through District business offices and through exhibits and community events.
III INCENTIVES	
Device Distribution	Low-water-use devices available through the District's business offices to retrofit existing plumbing fixtures.
Pricing	A uniform rate structure intended to encourage efficient water use.
IV REGULATION	
Water use during water shortage emergency.	Regulations requiring efficient water use during emergencies.

waste. Program elements are of two general types: Demand management elements, described in Table II-1, are intended to reduce the use of water by individual District customers. Supply management elements are intended to produce more efficient operation and reduce losses in EBMUD's water supply system. Current supply management elements include:

- An extensive effort to detect and prevent leaks, including surveying nearly 1700 miles of pipe each year, and a corrosion control program utilizing galvanic protection at appropriate locations.
- Development and participation in water reclamation projects, both use of reclaimed wastewater at irrigation sites and reclamation of backwash water at the District's filter plants (Table II-2).

The success of the existing program is believed to have reduced water use by the District and its customers by an average of nearly 12 million gallons a day.

The current annual cost of the water conservation program includes demand management activities at $235,000, leak detection program at $715,000, and reclamation projects at $106,000.

EXPANDED WATER CONSERVATION PROGRAM

The existing water conservation program will be continued and will be supplemented with additional elements to reduce the rate of increase in demand as the number of customers increases. The expanded program for demand management is described in Table II-3 and highlighted as follows:

- Device Distribution — Provide free devices for all existing customers to retrofit showers and toilets.
- Water Audits — Offer to review indoor water use of any customer and commercial/industrial processes to suggest ways of improving water use efficiency.
- Water Efficient Landscapes — Promote use of low-water-consuming-plants and efficient irrigation for all existing customers through rebates and free consultation. Require these

Reclamation Projects

Table II-2

PROJECT	DESCRIPTION	STATUS	ANNUAL WATER SAVINGS (MGD)
EBMUD Filter Plants	Reclaimed backwash water from District filter plants	Standard Practice	2% of total treated water
Richmond Golf Course	Reclaimed wastewater from West Contra Costa Sanitary District for irrigation of the Richmond Golf and Country Club	Service Started 1984	0.25
EBMUD Special District 1	Reclaimed wastewater for landscape irrigation and general washdown at the facility	Standard Practice	0.54
Galbraith Golf Course	Reclaimed wastewater from the San Leandro Treatment Plant for irrigation of the Galbraith Golf Course in Oakland	Planning	0.24
Dublin San Ramon Services District	Reclaimed wastewater from Dublin San Ramon Services District for irrigation of golf courses, parks, playgrounds, and school grounds in the San Ramon Valley	Planning Study	1.4
Chevron U.S.A. Oil Refinery Cooling	Reclaimed wastewater from West Contra Costa Sanitary District or the Richmond Municipal Sewer District for reuse in Chevron's recirculating cooling tower	Preliminary Investigation	4.0

Recommendations For Expanded Water Conservation Program

Table II-3

DEMAND MANAGEMENT ELEMENTS	START-UP TIME	FIRST YEAR COSTS*	ANNUAL COST AFTER FIRST YEAR*
A. WATER SAVING DEVICE DISTRIBUTION Offer 20,000 retrofit kits (first year) at EBMUD business offices and through water audits including low–flow showerheads and water bag for toilets to increase the number of water–saving devices installed in single and multi–family residences as well as commercial, institutional,** and industrial premises.	6 months	$ 150,000	$ 75,000
B. WATER AUDITS Offer to inspect water–use practices of existing industrial, commercial, institutional and single and multi–family residential customers and make recommendations for improved efficiency. Offer retrofit kits where applicable. Primary focus will be on indoor and process water use.	6 months	100,000	100,000
C. LANDSCAPE CONSULTATION Introduce all existing and new customers to low water–using landscape concepts and materials through mailings and personal contact. Customers will be offered technical assistance and District literature.	6 months	50,000	50,000
D. LANDSCAPE REBATE Offer a rebate to existing customers to provide an incentive to install water–conserving landscapes that meet District criteria (SF up to $300 and MF up to $5000, based on landscaped area).	1 year	550,000	550,000
E. SYSTEM CAPACITY CHARGE (SCC) DISCOUNT Offer discounts on the SCC paid by all new customers who exceed code requirements for shower heads and toilets.	1 year	100,000	100,000
F. LANDSCAPE WATER USE EFFICIENCY IN NEW DEVELOPMENTS Establish landscape water-use efficiency regulations for new residential, industrial, institutional, and commercial developments through cities and counties or by the District, if necessary; or Offer incentives to install water-conserving landscapes that meet District criteria through an SCC discount or rebate program.	3 months	50,000	50,000
G. PUBLIC INFORMATION Provide public information programs such as landscape booklets and brochures, exhibits, etc. to support and promote water conservation by demonstrating the methods for conserving water and the benefits of efficient water use.	6 months	125,000	50,000
H. SCHOOL EDUCATION Increase the promotion of wise water use habits and expand appreciation for water as a limited natural resource in primary and secondary schools.	3 months	25,000	10,000
I. SUPPORT ACTIVITIES Establish a Landscape Advisory Committee to provide technical support and act as liaison with the professional landscape community.	3 months	–	–
J. DISTRICT WATER USE ACTIVITIES Develop procedures to review District landscaping plans and retrofit existing District landscape to assure efficient water use.	on–going	25,000	10,000
K. WATER PRICING STUDY Study water conserving rate structures as a means of increasing water use efficiency.	1 year	15,000	0
L. PRESSURE REDUCTION STUDY Identify areas of high water pressure (greater than 80 psi) and investigate the feasibility of a pressure reduction program.	1 year	30,000	0
TOTAL COST		$1,220,000	$995,000

*Costs shown are District costs at FY 1986 level excluding departmental and administrative and general overhead

**Institutional customers include public agencies

practices in new residential, commercial, institutional, and industrial, developments through enforcement of regulations or by offering incentives through a SCC discount or a landscape rebate program.

- Public Education — Expand current efforts and produce new exhibits, brochures, and school material to encourage efficient water use.
- District Activities — Reduce water use at District facilities and pursue pricing and pressure reduction policies to encourage conservation.

In developing the expanded water conservation program other alternatives were considered, such as regulations which would require water efficient landscapes in single family homes. While not initially recommended as part of the water conservation program, the viability of such an alternative will continue to be evaluated.

Initial costs for the expanded conservation program's demand management elements, including current activities that are continuing, are projected to be $1.22 million. Costs in subsequent years will be lower once materials are developed and program elements are implemented.

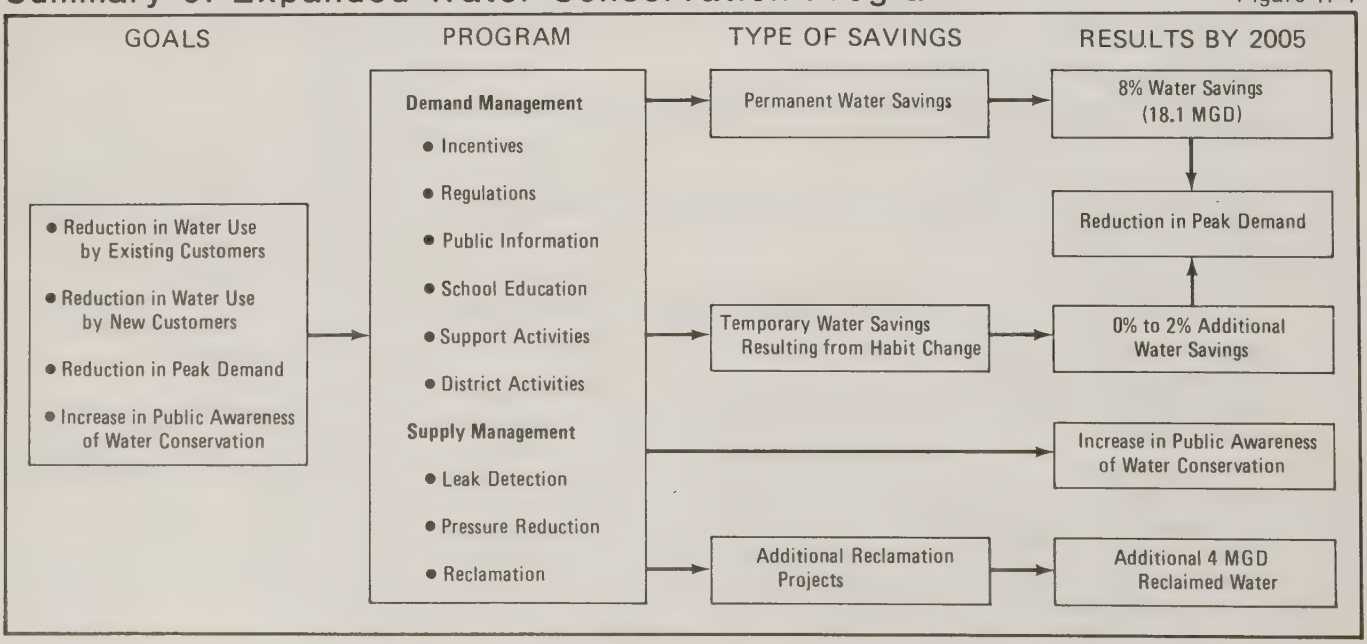
For supply management, EBMUD will continue to encourage wastewater reclamation and proceed with additional projects whenever they are found to be technically and financially feasible. Costs associated with reclamation projects are expected to rise to $327,000 per year. In addition, EBMUD will continue the leak detection program to further reduce losses in the distribution system at a cost of $715,000 per year.

BENEFITS OF THE PROGRAM

EBMUD considered water savings, cost-effectiveness, impacts, and likelihood of success in selecting the elements of the expanded conservation program and will monitor and review each element in the future. With the expanded program, water use by the year 2005 is expected to be 18.1 MGD (8 percent of customer demand) less than it would have been without the program. Figure II-4 summarizes the expanded conservation program and shows the expected water savings.

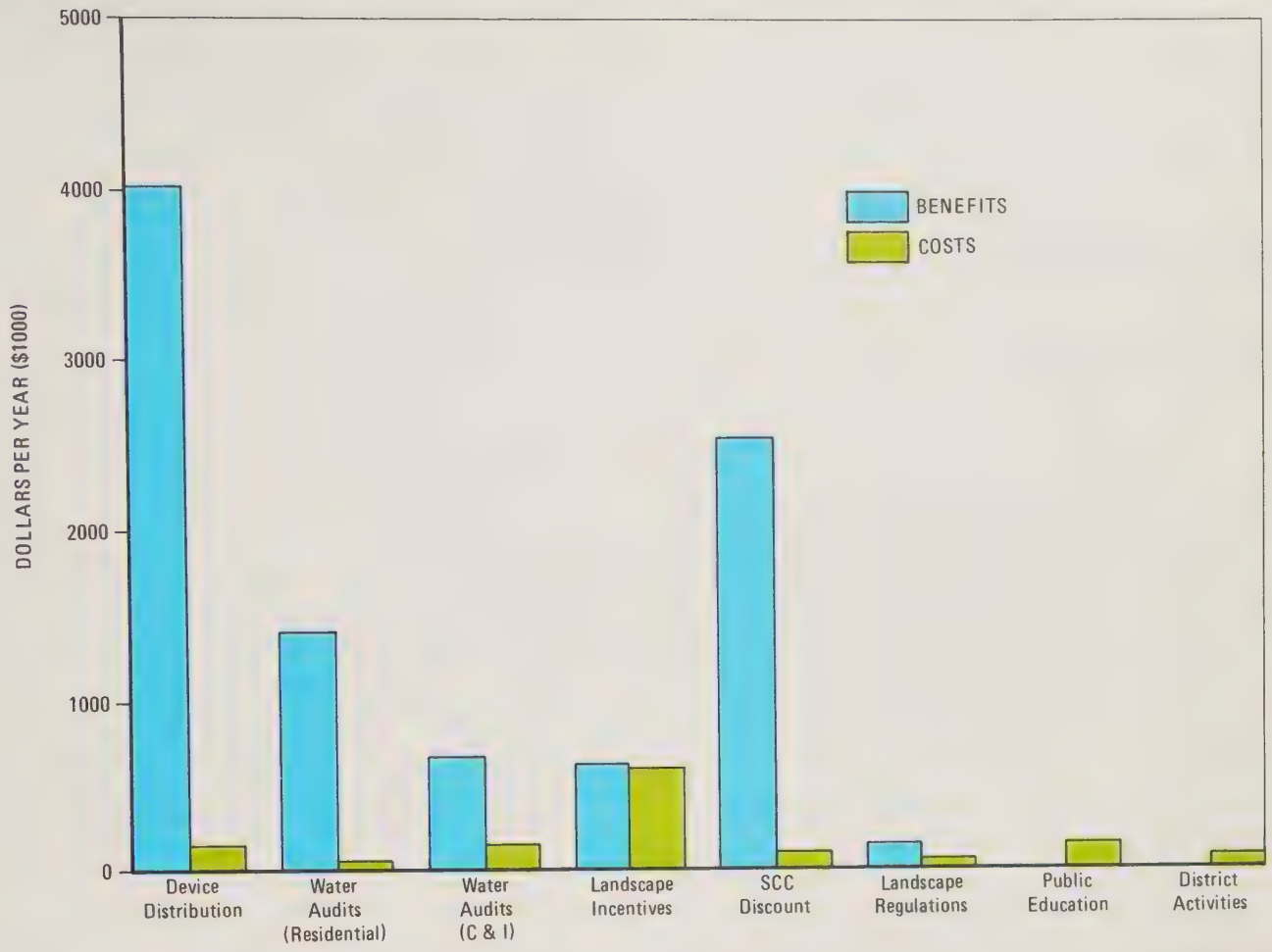
Figure II-5 depicts the cost and the benefits to EBMUD and its customers from demand management through the expanded water conservation program. The costs of the expanded conservation program are justified by its merit alone; but as the cost-benefit analysis in Figure II-5 shows, the savings to customers and EBMUD far exceed program costs. Also, water saved through the conservation program will reduce the quantity of water used from future supplemental supplies. However, other factors affect the need to implement supplemental supplies. EBMUD will make decisions relating to those supplies as part of the development of the Water Action Plan.

Summary of Expanded Water Conservation Program Figure II-4



Expanded Water Conservation Program Benefits and Costs

Figure II-5



CATEGORIES OF ELEMENTS	ELEMENTS (TABLE II-3)	WATER SAVINGS BY 2005 (MGD)	CUSTOMER			DISTRICT			COMBINED		
			ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO	ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO	ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO
Water Saving Device Distribution	A	5.3	3136	0	---	897	150	6.0	4033	150	26.9
Water Audits (Residential)	B	2.1	1035	0	---	365	50	7.3	1400	50	28.0
Water Audits (Comm. & Indust.)	B	3.3	100	100	1.0	566	50	11.3	666	150	4.4
Landscape Incentives	C, D	3.8	0	0	---	616	600	1.0	616	600	1.0
SCC Discount	E	2.8	2050	0	---	490	100	4.9	2540	100	25.4
Landscape Regulations	F	.8	0	0	---	137	50	2.7	137	50	2.7
Public Education	G, H	---	0	0	---	0	150	---	0	150	---
District Activities	I, J, K, L	---	0	0	---	0	70	---	0	70	---
TOTAL		18.1	6321	100	63.2	3071	1220	2.5	9392	1320	7.1

Chapter III
Water Use

This chapter summarizes past and present water use in EBMUD's service area and develops estimates of water demand to the year 2020. Estimates of population, housing, employment and water use are presented based on projections of demographic, economic, and land use data consistent with cities' and counties' general plans, and water consumption data collected by EBMUD.

SERVICE AREA

EBMUD's present service area and how it has grown over the decades is shown on Figure III-1. The service area is largely defined by geographic parameters such as the San Francisco Bay, San Pablo Bay, and Carquinez Strait on the west and north, the service area of Contra Costa Water District on the northeast, and the Dublin San Ramon Services District and City of Hayward to the south. Table III-1 is a listing of cities, and their populations, served by EBMUD.

Boundaries and Spheres of Influence

The EBMUD ultimate boundary and spheres of influence are shown on Figure III-2. The ultimate boundary represents the future service area assumed by EBMUD in planning for future water service. EBMUD does not control development within the ultimate boundary; however, there are times when planning and development of water facilities is undertaken preceding actual development in anticipation of requests for service. This

Areas Served by EBMUD Table III-1

CITY/COMMUNITY	1985 POPULATION[1]
Alameda County	
Alameda[2]	70,400
Albany[2]	15,100
Berkeley[2]	106,600
Castro Valley[3]	45,500
Emeryville[2]	5,000
Hayward[4, 5]	14,900
Oakland[2]	352,100
Piedmont[2]	10,400
San Leandro[4]	82,100
San Lorenzo[3]	20,500
Subtotal	722,600
Contra Costa County	
Alamo–Blackhawk[3]	13,200
Danville[4]	32,100
El Cerrito[4]	29,000
Hercules[4]	9,700
Lafayette[4]	22,600
Moraga[4]	15,000
Orinda[4]	17,300
Pinole[4]	24,600
Pleasant Hill[4, 5]	5,400
Richmond[4]	90,700
Rodeo–Crockett[3]	11,300
San Pablo[4]	24,900
San Ramon[4]	25,500
Walnut Creek[2, 5]	42,100
Subtotal	363,400
Total	1,086,000

(1) 1985 estimate based on ABAG projections
(2) City
(3) ABAG Subregional Study Area
(4) City Sphere of Influence
(5) City not entirely served by EBMUD; population shown is served by EBMUD

EBMUD's Service Area and Growth by Decade

Figure III-1

EBMUD Boundaries

Figure III-2

is done to minimize the overall costs and the number of disruptions later when facilities are constructed to provide water service to new customers.

EBMUD's Spheres of Influence, established by the Local Agency Formation Commissions (LAFCOs) of Alameda and Contra Costa Counties, describe the counties' current determination of the potential extent of urban developments for the next decade. EBMUD's Spheres of Influence are approximately the same as the urban spheres for the various cities within the service area.

Geographic/Climatic Conditions

Within the EBMUD service area there are significant differences in geographic, climatic, and land use characteristics. These characteristics are important in that they influence how water is used in various portions of the service area. EBMUD considers these characteristics important for projecting future water demands.

Geographically, the western portion of the service area is characterized by a plain which extends from Richmond to Hayward, and from the shore of the Bay inland to the base of the Oakland/Berkeley Hills which rise to about 1900 feet. East of the Oakland/Berkeley Hills the terrain is characterized by rolling hills as the land descends to about 100 feet near Walnut Creek. Much of the central, hilly portion of the service area is undeveloped and used as watershed for the District's terminal reservoirs.

Areas near the Bay experience a moderate climate that is tempered by ocean and Bay waters. In contrast, inland areas such as Lafayette, Walnut Creek, and the San Ramon Valley experience greater extremes in climate, being cooler in the winter and hotter in the summer.

A majority of the high density urban development has occurred along the Bay plain and includes residential, commercial, institutional, and industrial developments. Other urban developments include Walnut Creek and Pleasant Hill, and more recently, the San Ramon Valley which is experiencing substantial growth.

The EBMUD service area is divided into seven geographical regions for the purpose of planning distribution system facilities and for assigning charges to new customers for costs of constructing new facilities. These regions are shown on Figure III-3. The seven regions also define areas which have similar water use patterns due to common geographical, climatological, and land use characteristics. Figure III-4 compares single family water use in the seven regions to each other.

PAST AND PRESENT WATER USE

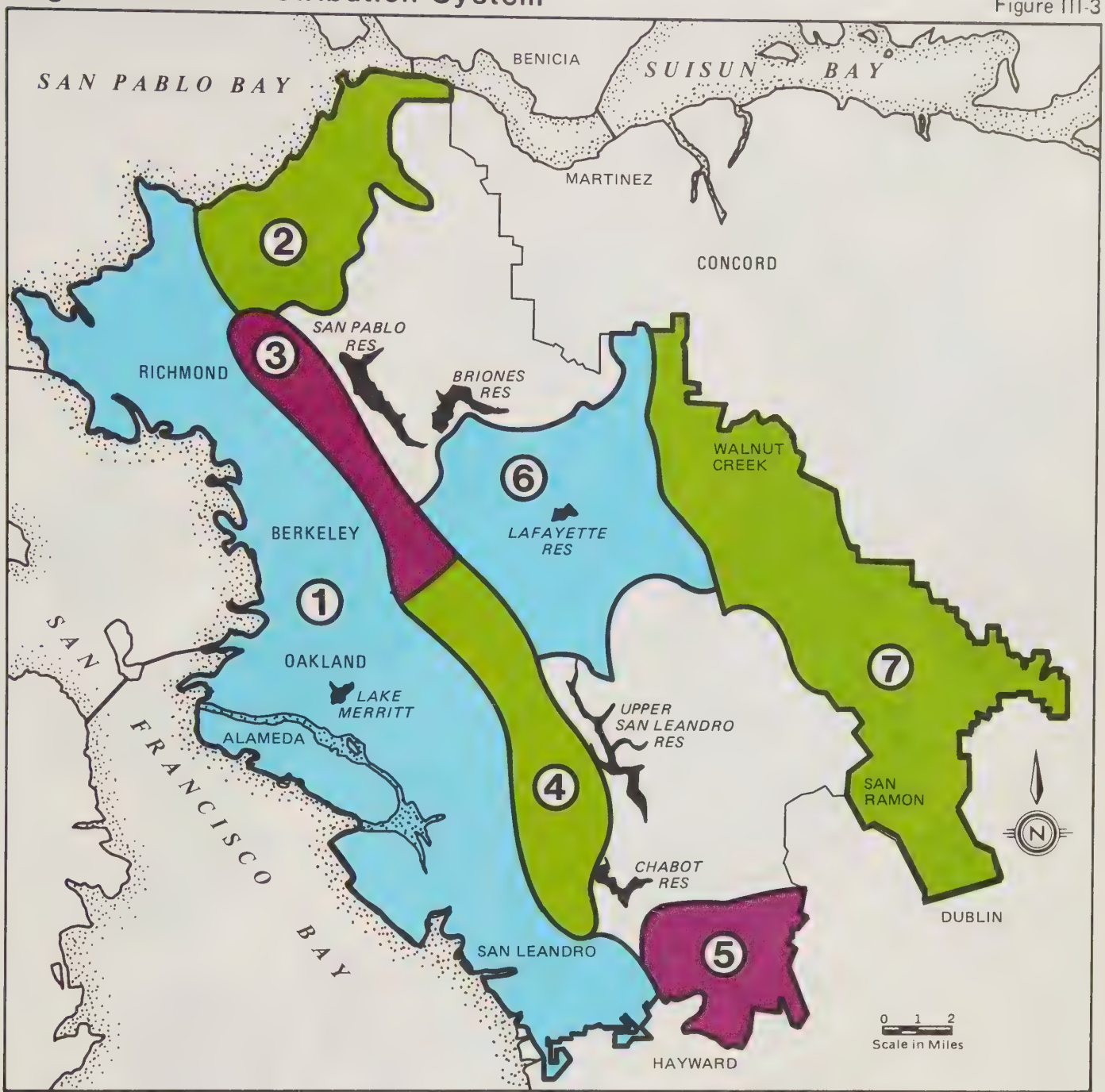
Figure III-5 illustrates the historic water use within EBMUD. The large reduction in use in the mid-seventies reflects the effects of the 1976-77 drought. The 1975-76 and the 1976-77 runoff seasons produced the worst continuous dry period ever recorded in the service area and in the Mokelumne watershed, where EBMUD obtains about 95 percent of its water supply. After the 1976 seasonal runoff, EBMUD requested that customers voluntarily cutback water use by 25 percent. When it became evident in 1977 that runoff was even lower, the District imposed a mandatory water conservation program aimed at an overall 25 percent reduction in water use. In May of 1977 the water supply situation became more serious, and the District imposed a 35 percent cutback for the remaining 1977 calendar year.

Table III-2 compares the water use by category for the years 1975, 1977, 1980, 1983, and 1984. The 1975 data is indicative of an average consumption pattern prior to the 1976-77 drought. The effectiveness of the mandatory conservation during the drought is reflected in the 1977 data. Customers responded well to the conservation program, and as a whole came up with a larger reduction in use (about 39 percent) than was expected.

In the years following the drought, water use remained below pre-drought levels and is just now returning to those levels, although with an increased number of customers. The data in Table III-2 show this trend. While much of the water conservation efforts resulted in short-term reductions such as habit changes, many of the structural changes, such as industries modifying water-using equipment, resulted in long-term water use reductions. These long-term reductions are now reflected in the normal water usage of the service area. Even though water demand is increasing there is improved efficiency in water use. Figure III-5 illustrates conceptually the increased effi-

Regions of the Distribution System

Figure III-3



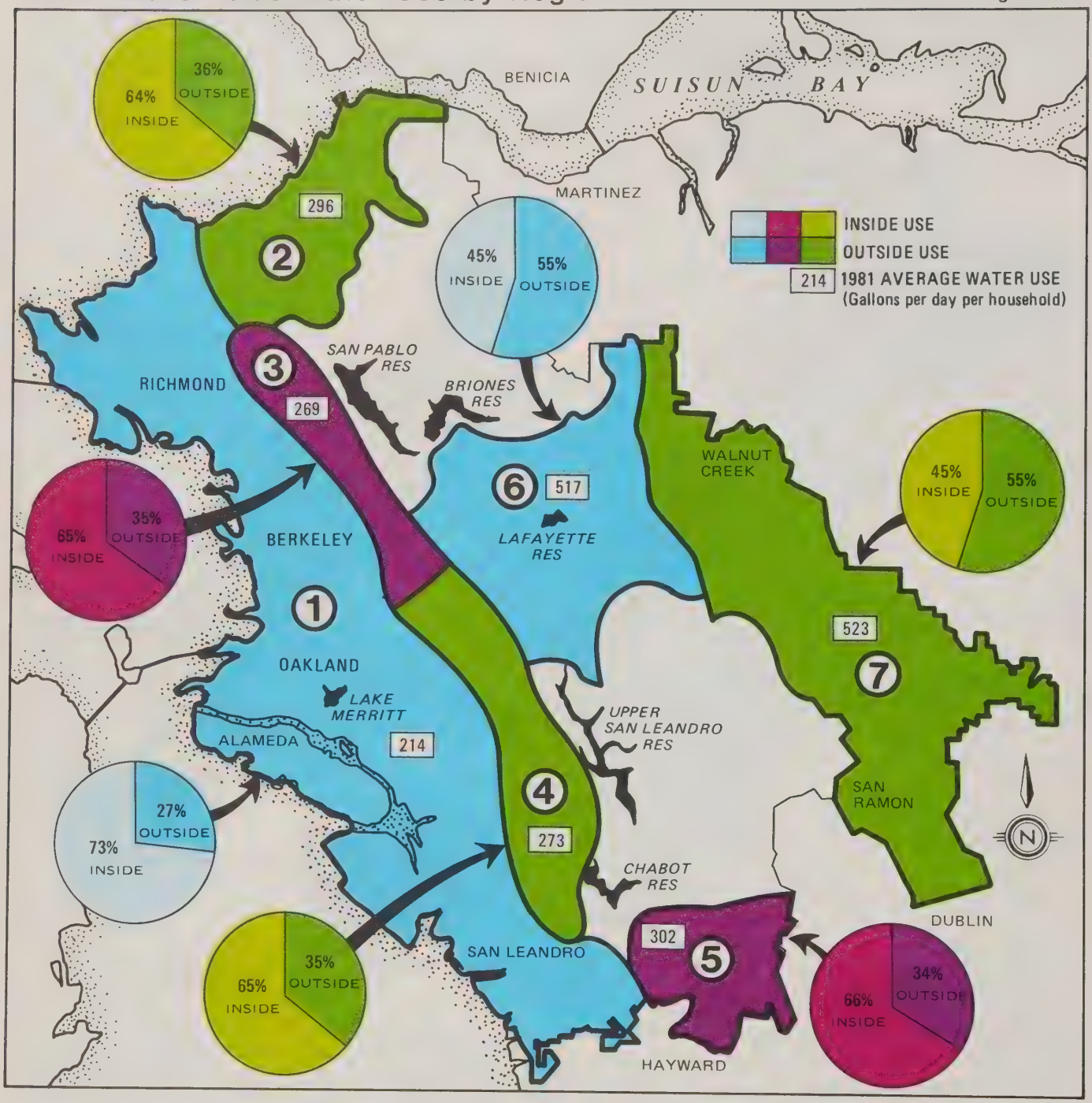
ALAMEDA COUNTY	REGION 1	2	3	4	5	6	7
Alameda	●						
Albany	●						
Berkeley	●		●				
Castro Valley					●		
Emeryville	●						
Hayward*	●				●		
Oakland	●		●	●			
Piedmont	●			●			
San Leandro	●			●			
San Lorenzo	●						

CONTRA COSTA COUNTY	REGION 1	2	3	4	5	6	7
Alamo-Blackhawk							●
Danville							●
El Cerrito	●		●				
Hercules		●					
Lafayette						●	
Moraga						●	
Orinda						●	
Pinole		●					
Pleasant Hill*						●	●
Richmond	●	●	●				
Rodeo-Crockett		●					
San Pablo		●					
San Ramon							●
Walnut Creek*						●	●

*City not entirely served by EBMUD

Single Family Residential
Inside and Outside Water Use by Region

Figure III-4



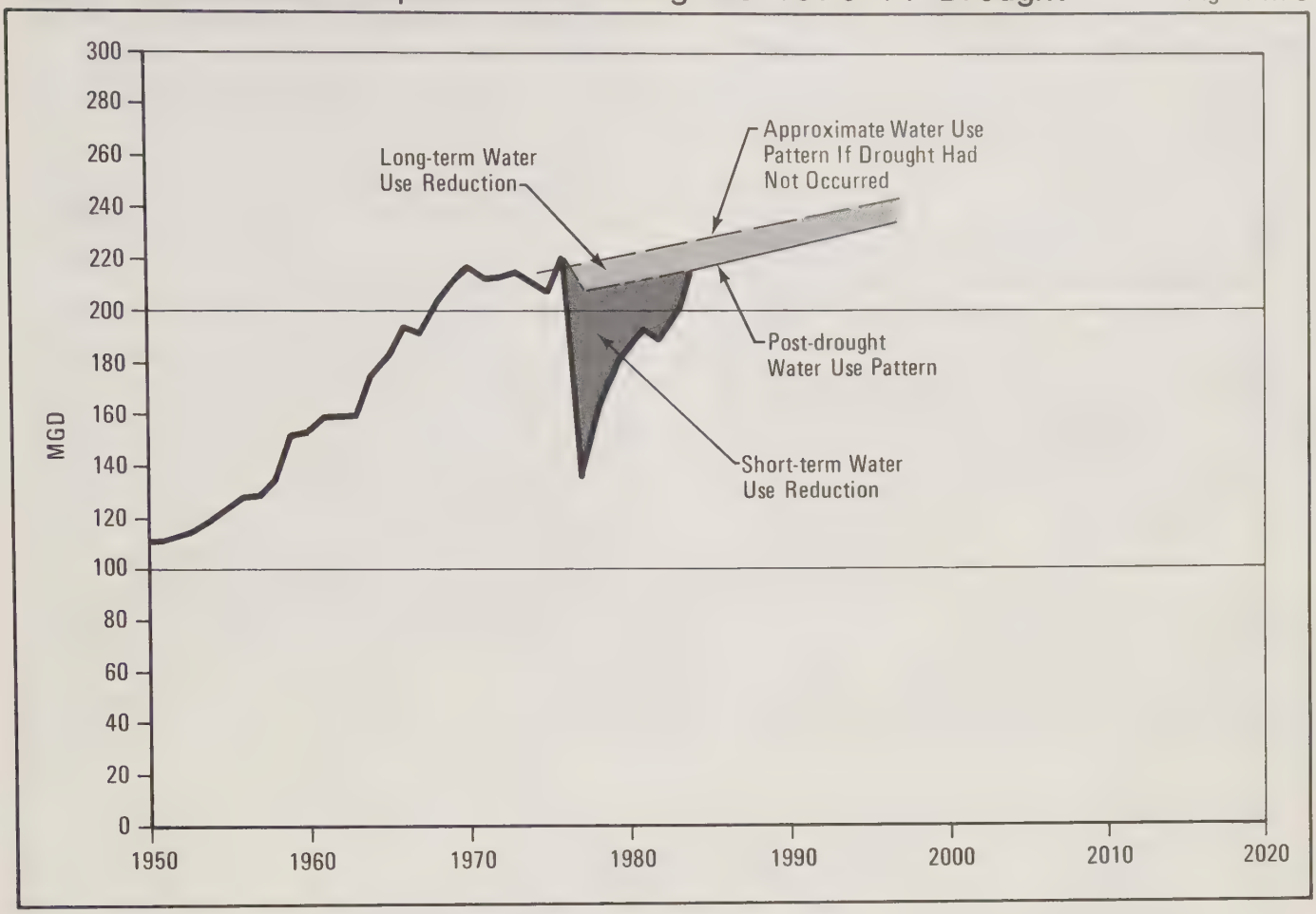
ciency which can be attributed to the long-term reductions initiated during the drought.

As illustrated by Figure III-5, the historical water use in 1970, 1972, 1976, and 1984 was not appreciably different. If water conservation measures (beyond those contemplated in this Urban Water Management Plan) offset the increased demand for water associated with service to new users, or by existing customers, the flat historic water use trend of 1970, 1972, 1976, and 1984 might continue.

Low precipitation in the early months of 1984 caused a dry year pattern of water use for that entire year. The rainfall pattern for 1983 was

Historical Water Use and Effects of Water Conservation Implemented During the 1976–77 Drought

Figure III-5



higher than normal causing lower than normal water use. Average annual demand for these two years may be compared in Table III-2.

EBMUD maintains extensive water use data. This information is used for many purposes including, but not restricted to, projecting future demands and identifying areas for expanded water conservation efforts. Table III-3 compares inside and outside water use for several customer classes based on 1984 data. Figure III-6 provides a breakdown of the specific types of uses within the residential category.

WATER DEMAND PROJECTIONS

The current water demand projections have been developed by EBMUD based on customers' water use patterns and projected socioeconomic data acquired from various sources.

Historical Water Use by Category (MGD)

Table III-2

CATEGORY	1975	1977	1980	1983	1984
Metered Water Use					
Residential – Single Family	79	40	75	80	88
– Multi-Family	26	21	26	28	30
Commercial & Institutional	28	19	26	28	31
Industrial – Oil Refineries	22	18	17	14	17
– Other	22	16	15	15	16
Park, Golf & Cemetery	8	4	9	9	12
Miscellaneous	3	1	1	2	2
Subtotal*	188	118	169	176	196
Gross Water Use					
District Use	1	1	1	1	1
Unaccounted-for Water**	19	16	18	23	19
Total Water Use*	208	135	188	200	216

*Totals may not equal sum of categories due to rounding.
**Includes water system leaks and inaccurate meters.

Socioeconomic Data

EBMUD periodically reviews available projections and forecasts of population, housing, and employment from many sources. The sources of data used to estimate socioeconomic conditions in the EBMUD service area from 1985 to 2020 include the following:

- Association of Bay Area Governments (ABAG) Projections '83 and '85
- California Department of Finance (DOF) Reports 83 P-1 and 84 P-2
- Data from cities, counties and other planning agencies in the EBMUD service area

Figure III-7 compares county-wide population projections from ABAG, DOF, and PG&E.

ABAG'S Projections: The Association of Bay Area Governments periodically develops socioeconomic projections for the nine county San Francisco Bay region and for sub-regional divisions. Projections '83 includes projections from 1980 to 2000 of population, housing, and employment for the nine-county region. Recently, ABAG released Projections '85 which include population, housing, and employment projections from 1980 to 2005. While Projections '85 were released after developing the water demand projections, the demand projections have been modified to reflect

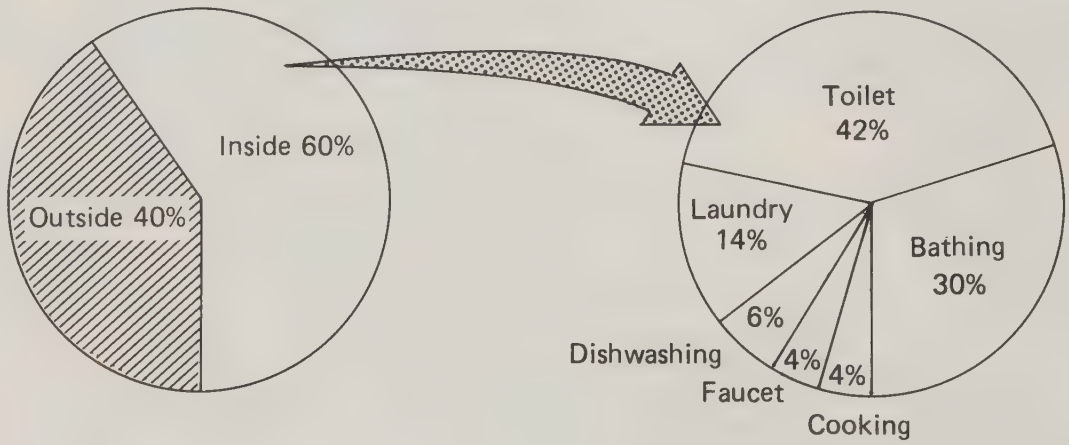
Inside and Outside Metered Water Use by Category

Table III-3

CATEGORY	INSIDE (%)	OUTSIDE (%)
Residential — Single Family	24.5	19.7
— Multi-Family	11.5	4.3
Commercial & Institutional	13.9	3.5
Industrial — Oil Refineries	8.3	—
— Other	8.5	1.0
Park, Golf, & Cemetery	.3	4.5
Total	67.0%	33.0%

Residential Water Use

Figure III-6



Inside Water Use	Percent	Gal/Capita/day
Toilet	42	27
Bath/Shower	30	19
Laundry	14	9
Dishwashing	6	4
Faucet	4	3
Cooking	4	3
Total	100%	65

the current data. The ABAG projections are the principal source of socioeconomic data for EBMUD's projections from 1985-2000.

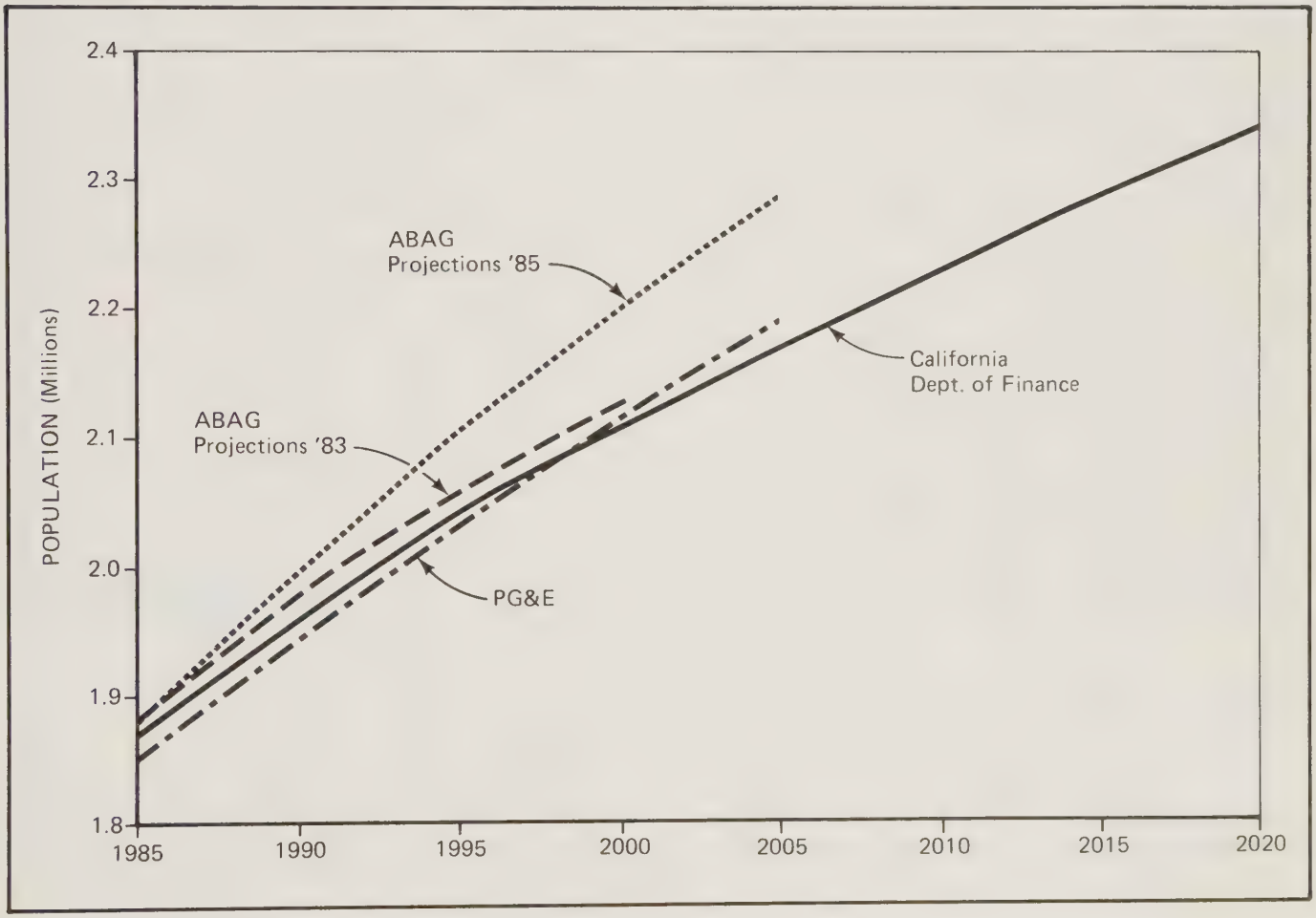
Department of Finance Reports: The Population Research Unit in the California Department of Finance (DOF) periodically prepares and publishes housing and population projections by county. Report 83 P-1 provides population projections for all California counties from the year 1980 to 2020.

Report 84 P-2 and related backup material gives household projections for all California counties from the year 1980 to 2010. In determining the household population from the population projections described above, a distinction is made between the portion of the population living in group quarters (i.e., military barracks and college dormitories). The household population is obtained by subtracting the projected group quarters population from the total population.

Data from Other Planning Agencies: During 1985, EBMUD consulted with the planning agencies in each city and county in the EBMUD service area, except in the San Ramon Valley. The purpose of these consultations was to independently verify and update the ABAG projections. The interviews supported the accuracy of the ABAG projections for the most part, except for new developments in the planning stage since ABAG Projections '83 were released. The San Ramon Valley area was covered by a special EBMUD study in 1984 for the Environmental Impact Report prepared for the major facilities projects in the distribution system. In that study, specific recent development activity in the area was iden-

Population Projections for Alameda and Contra Costa Counties

Figure III-7



tified which were not accounted for in ABAG's Projections '83. Projections '85 also included recent development activity not accounted for in Projections '83. Differences between the '83 and '85 projections have been included in the water demand projections.

EBMUD also consulted with the planning departments of the Pacific Gas and Electric Company (PG&E) and Pacific Telesis. PG&E has prepared county-wide projections of population from the year 1980 to 2005. Projections have been estimated for smaller areas but on a much shorter term (approximately 10 years). Pacific Telesis does not prepare county-wide long-range projections. The data obtained were compared to the ABAG and DOF data.

The data gathered from the sources mentioned above were used to develop housing, population, and employment projections within EBMUD's service area from 1985 to 2020. Both high and low projections were made representing the maximum and minimum levels of growth. ABAG has indicated that: "As a reference, Projections '83 would represent the upper bound of a forecast range. That is, at least at the regional level, expected growth should not exceed the levels identified in this publication. This is based on current information and may clearly change in the future". DOF data for Alameda and Contra Costa Counties closely agrees with ABAG data for 1980-2000. Housing, population, and employment projections obtained using the ABAG and DOF data were assumed to be the upper bound or high projection. The low projection was obtained by assuming that the housing, population, and employment growth estimated by ABAG would occur at a lower rate. Figure III-8 shows projections for housing, population, and employment, respectively, within EBMUD's ultimate boundary. Table III-4 presents housing and population projections for the seven regions within the District.

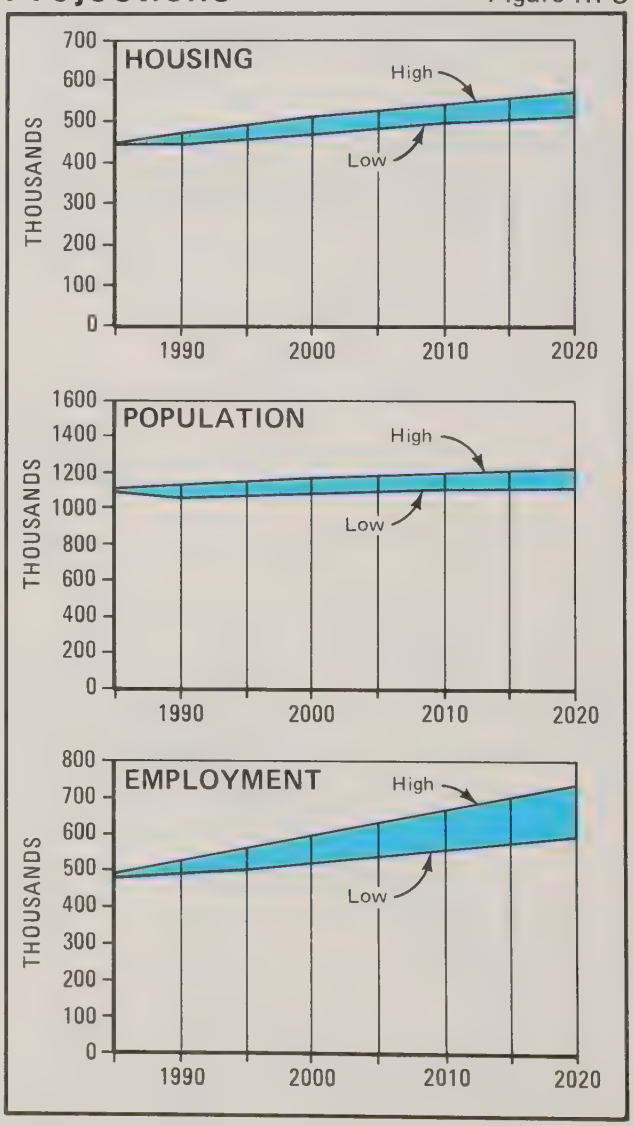
Water Consumption Data

EBMUD collects metered water use data of customers in the seven regions of the service area, using the computer-based Water Consumption Information System (WCIS). Monthly data from the WCIS provides water use information which has been grouped into the following seven categories:

- Residential — Single Family
- Residential — Multi-Family
- Commercial and Institutional
- Industrial — Oil Refining
- Industrial — Other
- Park, Golf, and Cemetery
- Miscellaneous Metered Water Use

Housing, Population and Employment Projections

Figure III-8



Water use data compiled by WCIS are used to project water demands for single family and multi-family residential customers.

Water used by EBMUD is largely unmetered. District use includes fire suppression, irrigation of District facilities, operational uses in flushing or washing facilities, accidental losses due to main breaks, and leakage at reservoirs, pumping plants, and filter plants.

Housing and Population Projections by Region*

Table III–4

HOUSEHOLDS**

REGION	1985	1990		2000		2010		2020	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	255600	257400	264700	264700	281800	273900	299000	281800	317200
		0.7%	3.6%	3.6%	10.3%	7.2%	17.0%	10.3%	24.1%
2	29300	30300	34700	34700	39400	38300	41400	39400	44000
		3.4%	18.4%	18.4%	34.5%	30.7%	41.3%	34.5%	50.2%
3	28100	28200	28400	28400	28900	28700	29500	28900	30100
		0.4%	1.1%	1.1%	2.8%	2.1%	5.0%	2.8%	7.1%
4	33800	34000	34600	34600	35900	35400	37300	35900	38900
		0.6%	2.4%	2.4%	6.2%	4.7%	10.4%	6.2%	15.1%
5	23400	23600	25700	25700	32800	30100	33800	32800	35900
		0.9%	9.8%	9.8%	40.2%	28.6%	44.4%	40.2%	53.4%
6	26700	27200	29100	29100	31800	30700	34400	31800	36600
		1.9%	9.0%	9.0%	19.1%	15.0%	28.8%	19.1%	37.1%
7	44700	45500	55600	55600	63600	61800	66300	63600	70400
		1.8%	24.4%	24.4%	42.3%	38.3%	48.3%	42.3%	57.5%
TOTAL	441600	446200	472800	472800	514200	498900	541700	514200	573100
		1.0%	7.1%	7.1%	16.4%	13.0%	22.7%	16.4%	29.8%

POPULATION**

REGION	1985	1990		2000		2010		2020	
		LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH
1	612200	593000	623200	590500	632000	588000	637700	585500	644000
		-3.1%	1.8%	-3.5%	3.2%	-4.0%	4.2%	-4.4%	5.2%
2	78200	79800	89000	89000	95800	94700	99500	95800	104500
		2.0%	13.8%	13.8%	22.5%	21.1%	27.2%	22.5%	33.6%
3	71400	68100	71700	66200	68800	64300	68800	62500	68800
		-4.6%	0.4%	-7.3%	-3.6%	-9.9%	-3.6%	-12.5%	-3.6%
4	84700	80800	84900	78500	81500	76300	81500	74100	81500
		-4.6%	0.2%	-7.3%	-3.8%	-9.9%	-3.8%	-12.5%	-3.8%
5	61500	62300	67200	67200	79000	75600	80900	79000	85000
		1.3%	9.3%	9.3%	28.5%	22.9%	31.5%	28.5%	38.2%
6	68700	70100	71500	71500	74200	72100	75800	74200	77300
		2.0%	4.1%	4.1%	8.0%	4.9%	10.3%	8.0%	12.5%
7	109000	110900	131300	131300	153500	146900	166000	153500	174200
		1.7%	20.5%	20.5%	40.8%	34.8%	52.3%	40.8%	59.8%
TOTAL	1085700	1065000	1138800	1094200	1184800	1117900	1210200	1124600	1235300
		-1.9%	4.9%	0.8%	9.1%	3.0%	11.5%	3.6%	13.8%

*See figure III–3 for location of region within EBMUD's service area.
**Percentages shown are changes from 1985 levels.

The total metered water use plus EBMUD's use is less than the gross water supplied to the distribution system. The difference is called unaccounted-for water. Unaccounted-for water represents about 8.2% of the District's gross water demand and includes undetected pipeline leakage, under-registration of customer meters, uncertain accuracy of large meters at filter plants and major transmission lines, and other indeterminable losses. Activities to reduce unaccounted-for water are described in Chapter V.

Demand Projections

Future water demands within the EBMUD present service area and ultimate boundary have been calculated for the period 1985 through 2020. The projections are presented as a range of demands, the High case and Low case. These two cases are based on different rates of growth for the service area as described previously. The high and low demand projections do not include adjustments for conservation, water and wastewater reclamation, or other demand reducing factors, which are applied later to determine projected water requirements.

Weather is the most significant factor in determining residential water use patterns. A review of the water use data shows that the last year of "average" water use occurred in 1981; years since then have either been wetter or drier than normal and have correspondingly lower and higher water use patterns. For this reason, 1981 residential water use data was selected as being characteristic for existing housing units. Water use for new housing units used in the demand projections have been developed for planning improvements in the distribution system. Per-household water use for new housing units has increased, on the average, due to larger lot sizes and other factors. Figure III-9 shows the single family residential water use rates for existing and new housing units in gallons per day per dwelling unit for each region of the service area.

Other categories of water use are assumed independent of population and housing projections and have been estimated on the basis of trends in the socioeconomic data, the WCIS data, and economic and land use expectations as obtained from interviews with larger customers and with city and county planning departments.

The total water demand is the quantity of water that must be supplied to the District's water distribution system to meet the projected water use for the various categories of District demands. The total water demand for 2020 is projected to range from a minimum of 247 MGD (Low Case) to a maximum of 294 MGD (High Case). Demand projections within the ultimate boundary for the various categories of water use are shown on Figure III-10.

Planning Projection Without Expanded Conservation Program

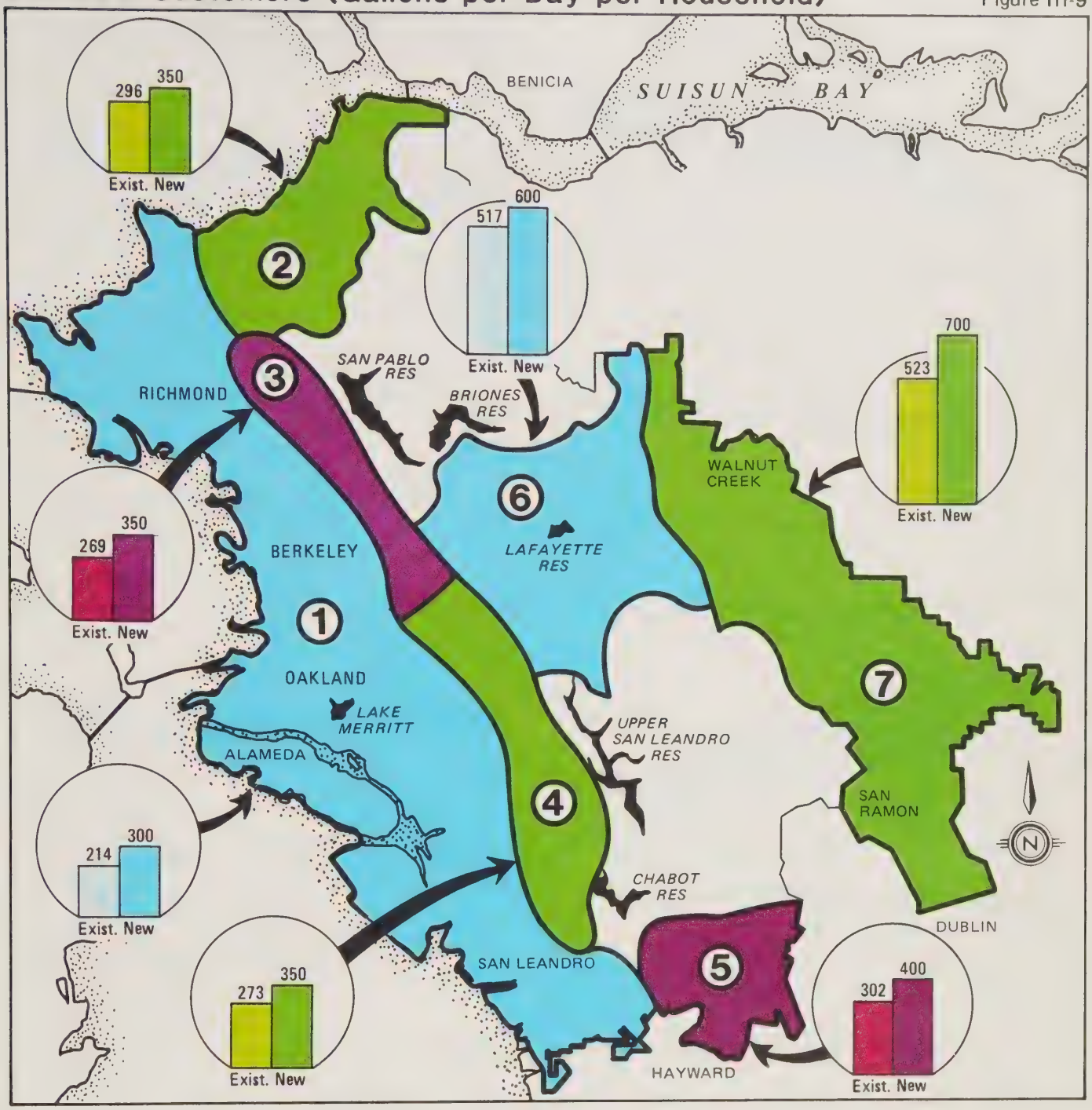
From the high and low projections a third projection was established for planning purposes. This planning projection is the mean of the high and low projections plus an added variance of 10 MGD which accounts for short-term fluctuations in the average annual demand due to weather patterns and economic conditions.

A review of the historical water use data indicates that demand does not follow a smooth, long-term trend line but fluctuates above and below the trend line. Statistical regression analysis of historical water use data from 1942 to 1976 determined that a linear expression had the best fit with a correlation coefficient of .98 and a standard deviation of 10 MGD. That is, a band ± 10 MGD wide around the trend line includes 74 percent of the years within the period. Two standard deviations, or ± 20 MGD, encompass 100 percent of the years.

The standard deviation is used to account for the majority of the fluctuations in water demand expected to occur during the period from 1985 to 2020. The planning level of demand ranges from 216 MGD in 1985 to 280 MGD in 2020.

Single Family Residential Water Use by Region for Existing and New Customers (Gallons per Day per Household)

Figure III-9

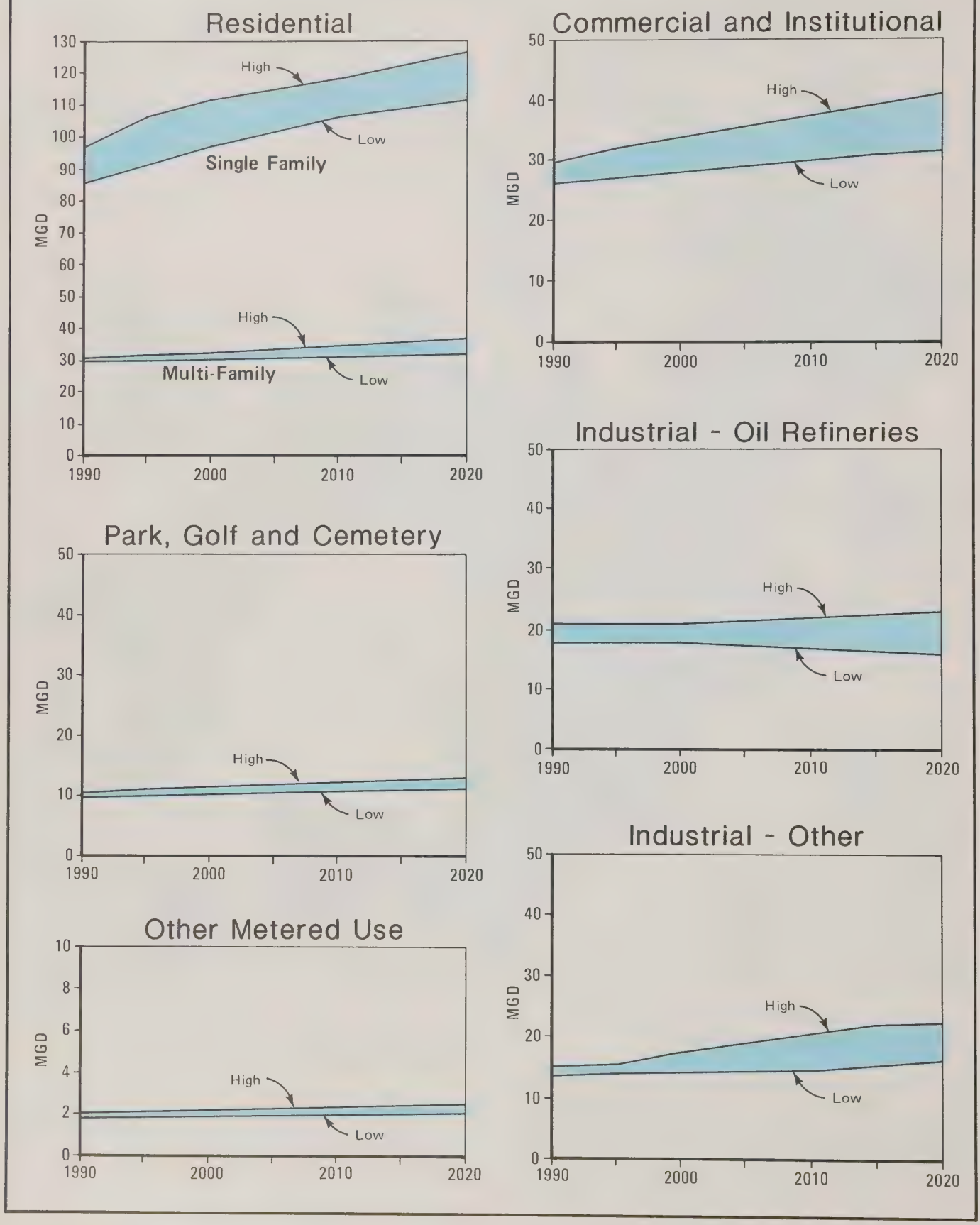


WATER REQUIREMENTS

Water requirements are the projected water demand less the water savings that result from the Expanded Water Conservation Program described in Chapter VI.

Planning Projection With Expanded Conservation Program

EBMUD's water conservation program is estimated to reduce water demand by about 8 percent. This reduction is based on consumption lev-


Residential
MGD
130
120
110
100
90
80
70
60
50
40
30
20
10
0
High
Low
Single Family
High
Multi-Family
Low
1990
2000
2010
2020
Commercial and Institutional
MGD
50
40
30
20
10
0
High
Low
1990
2000
2010
2020
Industrial - Oil Refineries
MGD
50
40
30
20
10
0
High
Low
1990
2000
2010
2020
Park, Golf and Cemetery
MGD
50
40
30
20
10
0
High
Low
1990
2000
2010
2020
Industrial - Other
MGD
50
40
30
20
10
0
High
Low
1990
2000
2010
2020
Other Metered Use
MGD
10
8
6
4
2
0
High
Low
1990
2000
2010
2020

els that are projected to normally occur without additional conservation and are planned to be achieved within 20 years. Wastewater reclamation projects are projected to save an additional 4 MGD by the year 2020.

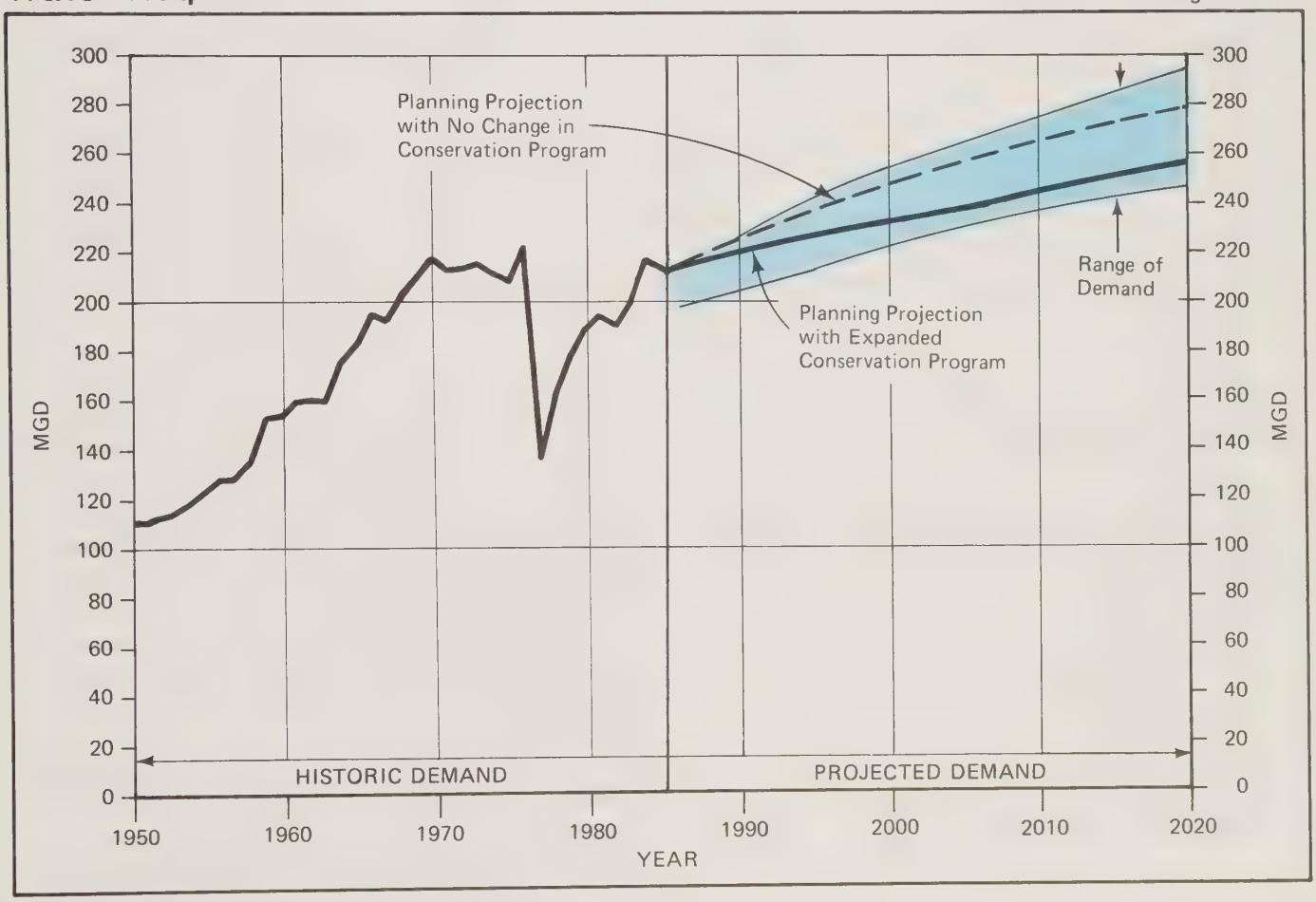
Water requirements represent the total amount of water that EBMUD needs to supply to its customers. Figure III-11 and Table III-5 illustrate EBMUD's projected water requirements up to the year 2020 including the water savings from the District's expanded water conservation program assuming that the projected savings occur. This projection will be used in the District's Water Action Plan to evaluate the needs of existing and future customers. EBMUD will continue to monitor actual water use and periodically update the water requirements projections.

WATER USE OUTSIDE THE ULTIMATE BOUNDARY

Since the early 1930's EBMUD has supplied water to adjacent agencies on an intermittent or temporary basis. Table III 6 shows the instances when interconnections have occurred. Currently, there are two physical connections between EBMUD and the City of Hayward. While not in use, these connections could provide for an exchange of water supplies in an emergency situation.

EBMUD has received a number of inquiries about supplying Mokelumne River water to adjacent areas; some of these areas are already served water by others and some areas are being developed and need a water supply. Those areas that have inquired about water supplies from EB-

Water Requirements Figure III-11



Water Demand and Requirements Projections (MGD)

Table III-5

CATEGORY	1990		2000		2020	
	Low	High	Low	High	Low	High
Metered Water Use						
Residential - Single Family	87	99	100	114	114	129
- Multi-Family	30	31	31	32	32	37
Commercial & Institutional	26	30	28	34	32	41
Industrial - Oil Refineries	18	21	18	21	16	23
Other	14	15	14	17	17	23
Park, Golf, & Cemetery	9	10	10	11	11	13
Miscelleneous	2	2	2	2	2	3
Subtotal*	185	207	203	232	224	268
Gross Water Use						
District Use	1	1	1	1	1	2
Unaccounted - for Water**	16	18	18	21	20	24
Total Demand*	203	227	222	254	247	294
Planning Projection						
Average of Demand Range	215		238		270	
Variance for weather and other conditions	+10		+10		+10	
Projected Additional Savings						
-Water Conservation	−4.5		−13.6		−20	
-Water Reclamation	−0.5		− 2		− 4	
WATER REQUIREMENTS*	220		232		256	

* Totals may not equal sum of categories due to rounding.

** Includes water system leaks and inaccurate meters.

MUD but are currently outside the ultimate boundary are listed below:

- Crow Canyon Road Extension Corridor
- Contra Costa Water District-Treated Water Division
- City of Martinez
- City of Antioch
- City of Pittsburg
- Dublin San Ramon Services District
- Tassajara Area
- Gumpert Ranch
- Pereira Ranch
- West Side of San Ramon

Two other areas outside the ultimate boundary are currently receiving temporary supplies of surplus water to alleviate water quality problems. Those are the City of Brentwood and the Contra Costa Water District service area at Port Costa. Both of those areas have also inquired about permanent supplies.

EBMUD will consider requests for water supplies outside the ultimate boundary on an individual basis and in accordance with established policies and procedures.

EBMUD has discussed with the Contra Costa County Water District (CCWD) possible ways to provide high quality surplus Mokelumne water to CCWD's service area. The two districts employed the firm of CH2M-Hill for a joint study of water

History of EBMUD Interconnections

Table III-6

DATE	LOCATION OF INTERCONNECTION	REASON FOR INTERCONNECTIONS	AGENCY SUPPLIED	QUANTITY SUPPLIED
1931 – 1932	Lake Chabot	Emergency supply to S. F. (delay in Hetch Hetchy System)	City of San Francisco	–
1931 – Present	Emeryville	Backup supply	USN Treasure Island	5.64 MG (FY '82)
1940's – 1950's	Carquinez Bridge	Service to Government facilities in Vallejo	City of Vallejo	3 – 5 MGD
1943 – 1963	Camp Stoneman Pittsburg	WWII–Army training base	US Army	?
1943 – Present	Concord Weapons Station	WWII–Critical service	US Navy	14.83 MG (FY '82)
1943 – 1977	Rough & Ready Island	WWII–Emergency service	US Navy	?
Mid 1960's – 1972	Antioch	Standby service during rebuilding of treatment plant	City of Antioch	0
11/63 – 1964	Walnut Creek	Pending annexation by EBMUD	CCWD	1.7 MGD (max)
10/66 – 2/67	Near Mallard Reservoir Concord	Backup supply during construction of treatment plant	CCWD	8 MGD (max)
1972 – Present (intermittent)	Crockett	Emergency service to Port Costa	CCWD	varies
6/72 – 7/72	Lone Tree Way Antioch	Andrus Island levee break	CCWD	40 MGD
7/72	Dublin/San Ramon	Zone 7 supply to Dublin endangered	VCSD	1 MGD
5/77 – 1/78	Pt. Richmond	Drought–water transfer from Hayward	MMWD	2000 gpm
Summer 1978	Dublin/San Ramon	Alternate supply during fluoridation installation	VCSD	?
7/84 – Present	Brentwood	High nitrate level in groundwater	City of Brentwood	1.25 MGD (max)

supply and water quality needs. That study was completed in December 1984 and concluded there are potential benefits to both districts. Table III-7 contains estimates of the water demands associated with each of the areas that have inquired about water service.

Potential Water Demands Outside EBMUD's Ultimate Boundary

Table III-7

AREA OR ENTITY	DEMAND, MGD		
	Present	2000	2020
Crow Canyon Road Extension	0	4	4
City of Brentwood*	1	2	3
Contra Costa Water District Treated Water Division	38	43	66
City of Martinez	9	9	10
City of Antioch	7	17	28
City of Pittsburg	10	17	24
Dublin San Ramon Services District	2	2	3
Port Costa Area*	0.1	0.2	0.2
Tassajara Area	0	5	5
Gumpert Ranch	0	**	**
Pereira Ranch	0	**	**
West Side of San Ramon	0	**	**

*Currently supplied by EBMUD on a temporary basis.
**Potential water demands unknown.

Chapter IV
Water Supply Availability and Deficiency

This chapter describes the relationship between EBMUD's water requirements and available supplies, and discusses the risk and magnitude of potential future deficiencies. In May 1985, EBMUD's Board of Directors adopted a policy providing for an annual review of the available supply and a follow-up report by April 15 on the adequacy of the supply for the near- and long-term.

WATER SUPPLY

EBMUD has a legal entitlement to 325 MGD from the Mokelumne River and an additional supply of up to 10 MGD from local runoff into the terminal reservoirs. EBMUD also has a contract with the U.S. Bureau of Reclamation (USBR) for American River water from the Folsom South Canal which was executed in 1970. However, currently there are no facilities for conveying the water to the EBMUD service area.

Figure IV-1 is a location map of EBMUD's major water supply facilities, these facilities include: 1) Pardee and Camanche Reservoirs on the Mokelumne River; 2) three Mokelumne aqueducts extending from Pardee Reservoir to Walnut Creek; and 3) five local terminal reservoirs used to provide an emergency standby supply, reregulate the Mokelumne supply, and capture local runoff. Figure IV-2 shows a schematic diagram of the District's water system. The total projected water supply available to the District in the year 2020 is shown in Table IV-1.

Mokelumne Supply

EBMUD holds two water rights (License 11109 and Permit 10478) which together entitle it to divert up to 325 MGD from the Mokelumne River at the District's Pardee Reservoir and to put this water to use in portions of Alameda and Contra Costa Counties for municipal and industrial purposes. EBMUD also possesses other State licenses and permits related to hydropower development on the Mokelumne River and the appropriation of runoff at the terminal reservoirs in the District's service area.

EBMUD's entitlement to the Mokelumne River is available after the water needs of more senior right-holders have been met.

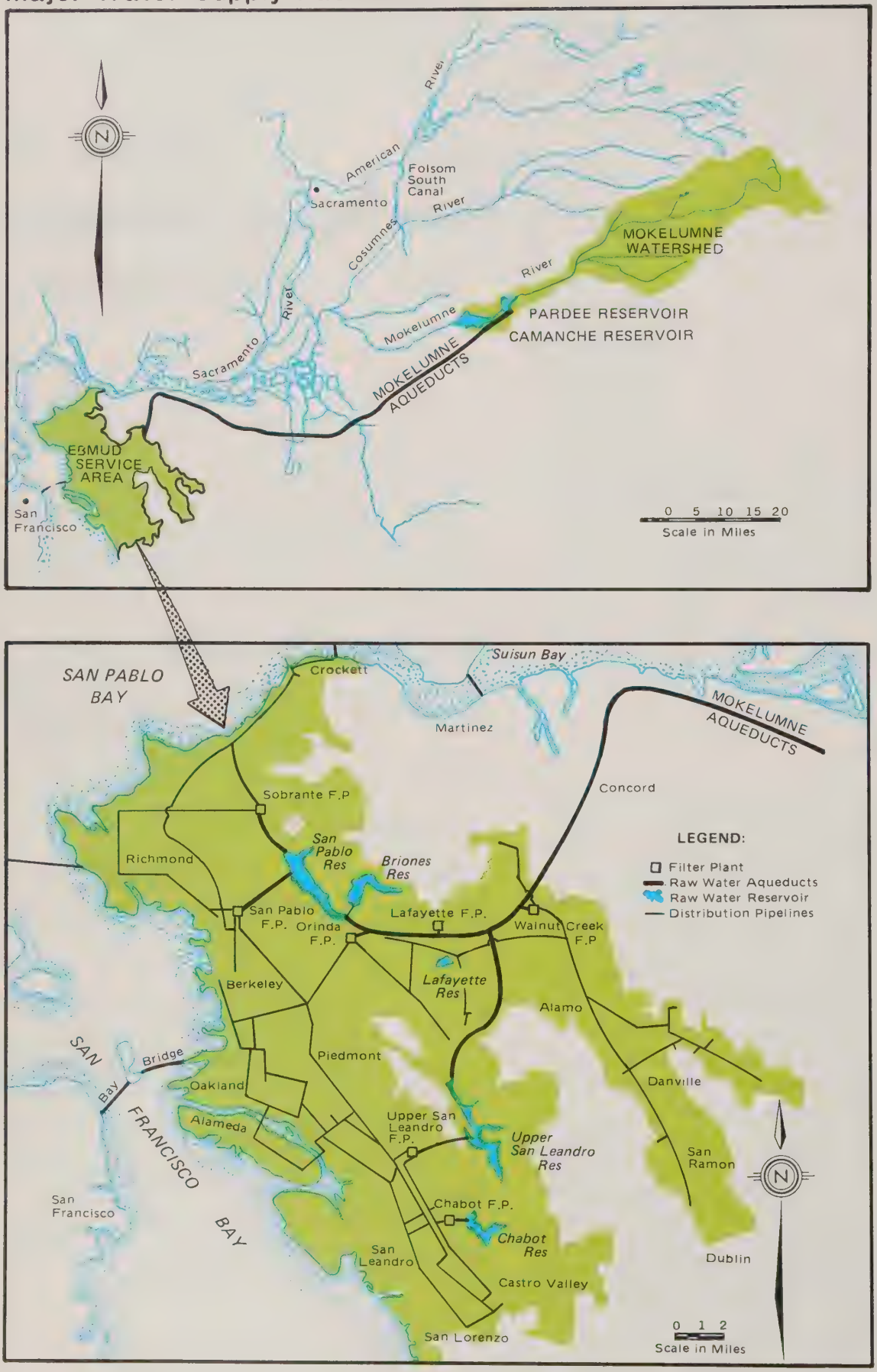
Water Supplies (MGD) Table IV-1

SOURCE	NORMAL PERIOD	DRY PERIOD 1928–35	CRITICAL PERIOD 1976–77
Mokelumne*	325	249	166
Terminal Reservoirs	10	0	0
USBR Contract	134	67 to 100	67

*2020 Conditions

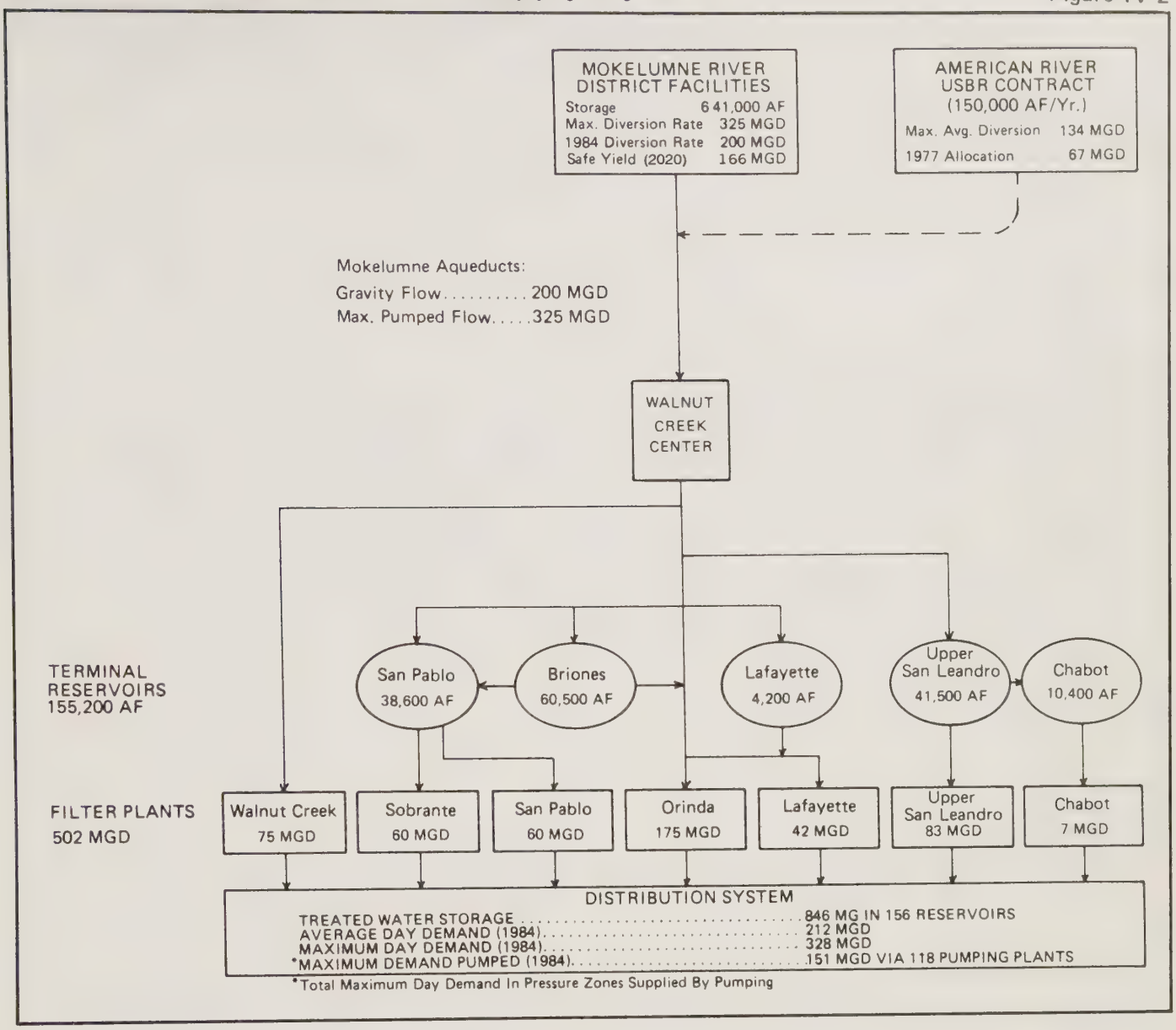
Major Water Supply Facilities

Figure IV-1



Schematic of EBMUD Water Supply System

Figure IV-2



EBMUD's position in the hierarchy of Mokelumne water users is determined by a variety of agreements between Mokelumne right-holders and permits which have been issued. Figure IV-3 shows how the river's flow is typically divided among the various users below Pardee Reservoir. Figure IV-4 shows the heirarchy or relative priorities of rights and other flow commitments in the Lower Mokelumne Basin.

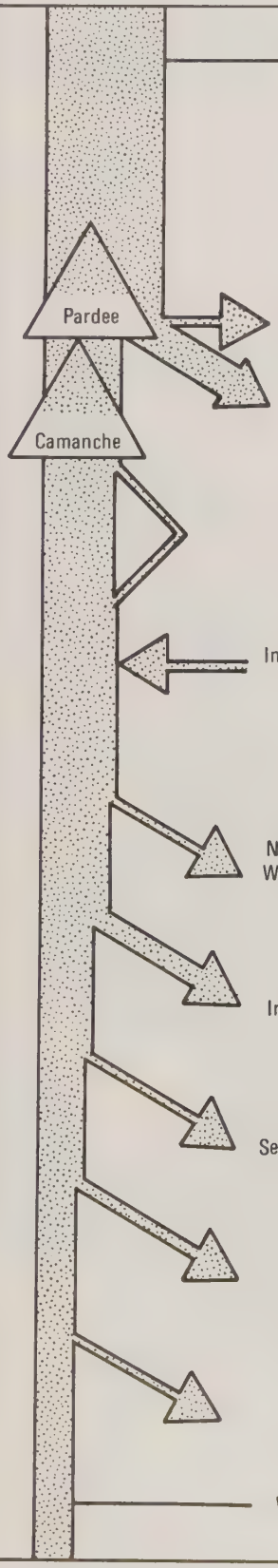
Terminal Reservoirs

The terminal reservoirs, shown in Figure IV-1, provide a total of 47.2 billion gallons of net usable storage. The functions of the terminal reservoirs are to:

- Provide standby supply
- Reregulate the Mokelumne supply
- Develop local yield

Mokelumne River Flow Downstream of Pardee (Acre-Feet Per Year)

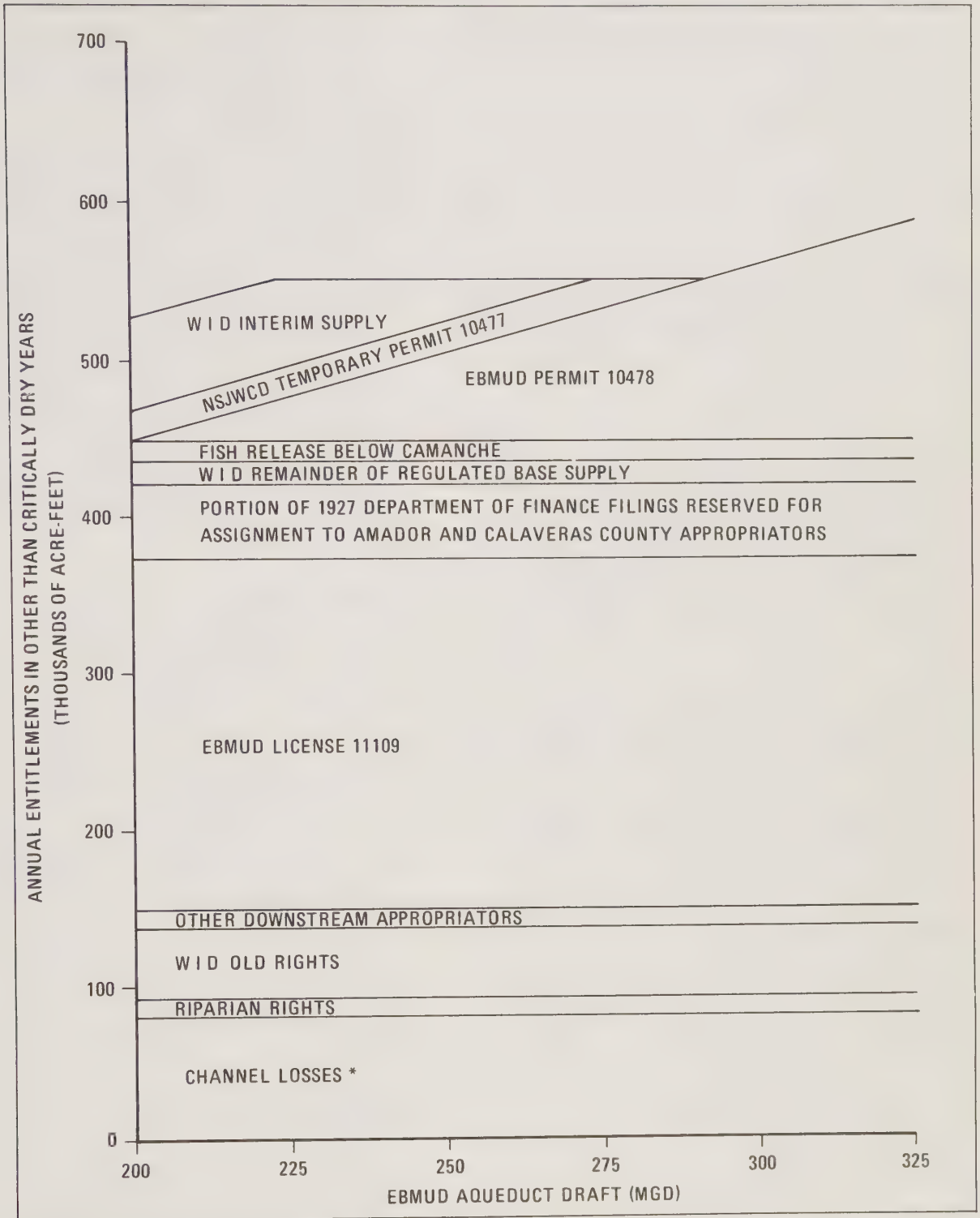
Figure IV-3



	Water Year 1979 (typical)	Average	Range	Maximum Entitlement
Mokelumne Hill Gage	678,300	735,500	150,300-1,788,090	----------
Jackson Valley Irrigation District	3,000	1,500	0-3,800	5,000
EBMUD Aqueduct Draft	187,100 (=167MGD)	196,500 (175 MGD) (20 years)	130,600-245,700 (117 MGD-219 MGD) (Last 20 years)	364,000 (=325MGD)
Fish Releases	16,200	18,300	5,900-23,300	13,000
Intermediate Inflow	7,100	6,600	80-13,900	----------
North San Joaquin Water Conservation District	7,400	7,400 (w/o 1976 and 1977)	4,600-9,500 (0 in 1976 &1977)	20,000
Woodbridge Irrigation District	76,200	95,100	51,400-121,700	116,700 (=60,000 Permanent Regulated +56,700 Interim)
Riparians and Senior Appropriators	14,600	13,700	10,100-18,200	20,618
Channel Losses	56,700	80,000	32,700-108,700	----------
City of Lodi	0	0	0	3,600 (If triggered by Lodi Decree)
Woodbridge Gage	341,700	453,800	15,800-1,559,600	----------

Mokelumne River Hierarchy of Consumptive Use Water Rights and Other Flow Commitments

Figure IV-4



*CHANNEL LOSSES DEPEND ON GROUND WATER LEVEL AND FLOW IN THE RIVER AND MUST BE INCLUDED IN EBMUD RELEASES BELOW CAMANCHE TO ASSURE THAT SENIOR RIGHTS-HOLDERS RECEIVE THEIR ENTITLEMENTS.

Standby Supply: The most important function of the terminal reservoirs is to provide a standby supply. If all five of EBMUD's terminal reservoirs were kept full, their combined 47.2 billion gallons of usable storage could supply EBMUD's customers 175 MGD for nine months or 260 MGD for half a year.

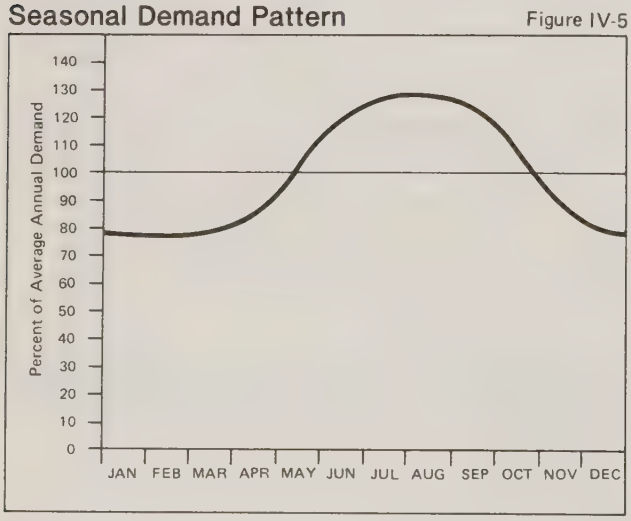
Pardee Reservoir and the Mokelumne watershed are located 82 miles from EBMUD's service area. The 14-mile section of the aqueducts that pass through the Sacramento-San Joaquin Delta is vulnerable to flooding and earthquake events which could cause extensive damage and result in an aqueduct outage of up to 33 months. The problem is caused by degradation of the Delta levee system and the unstable nature of the soils in the Delta. In addition, failure of other major facilities, such as the Lafayette Tunnels, could result in the loss of water supplies to all or part of the service area. For these reasons a standby supply is maintained to protect customers in the event of emergencies causing the loss of water supplies.

Reregulate Mokelumne Supply: The amount of water served to customers varies throughout the year, with peak demands occurring in the summer and minimum demands in the winter (see Figure IV-5). The three Mokelumne Aqueducts together are capable of delivering up to 200 MGD by gravity; with full pumping on the aqueducts, 325 MGD can be achieved. Flow rates between these amounts can be achieved by combinations of gravity and pumped flow.

In summer months, customer peak demand often exceeds the Mokelumne Aqueduct draft. During this time, water is drawn from the terminal reservoirs to make up the difference between the Mokelumne draft and customer demands. In winter months, when demand is lower, excess Mokelumne draft is added to the terminal reservoirs. Reregulating the Mokelumne water supply in this manner reduces operating costs and ultimately costs to customers.

Development of Local Yield: The yield from local runoff is dependent on two parameters. First, hydrologic conditions determine the amount of runoff in the local watersheds; in dry years, evaporation can exceed runoff resulting in no net yield. The second parameter is the amount of storage available for capturing local runoff. The lower the reservoirs are drawn down in the fall the greater the amount of water, assuming it is available, can be collected from runoff. The terminal reservoirs' other functions limit the space available to receive local yield. Thus, local yield is limited to about 10 MGD during normal hydrologic years and is zero in drought conditions.

Seasonal Demand Pattern Figure IV-5



USBR Contract

In 1970 EBMUD contracted with the U.S. Bureau of Reclamation (USBR) for a supplemental supply of American River water from the Central Valley Project (CVP). EBMUD's point of delivery is on the Folsom South Canal near Grant Line Road, about 12 miles south of the American River. The aqueduct system necessary to convey the water from the Canal to the EBMUD service area is the District's responsibility, and such facilities have not been constructed. EBMUD's contract is for 150,000 acre-feet annually (AFA) or about 134 MGD. This amount, however, can be reduced in drought years according to the contract and estimates of available CVP water supply by the USBR and DWR. Such contract allotment reductions occurred during the 1976-77 drought.

In April of 1977, the USBR informed EBMUD that its 1977 contract allotment would be 50 percent of its contract amount. In late 1977 and early 1978, EBMUD received an emergency delivery of approximately 25,000 acre-feet of contract water by pumping from Middle River in the Sacramento-San Joaquin Delta. This was necessary because the 1976-77 drought significantly reduced EBMUD's Mokelumne supply. Based on a

repetition of 1976-77 drought conditions, the "safe yield" of EBMUD's USBR supply is assumed to be 50 percent of the contract amount, or about 67 MGD.

WATER SUPPLY DEFICIENCY

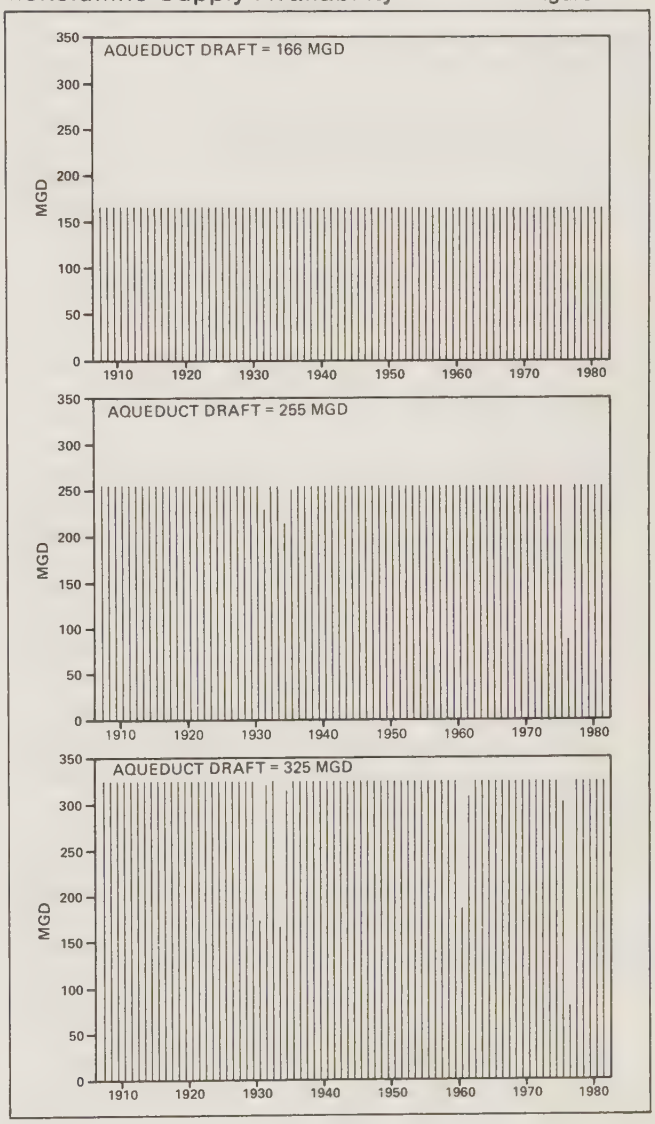
There are many factors that affect the quantity of water available to the District from the Mokelumne supply. These factors include hydrology as well as obligations to release water downstream for riparians, senior appropriators, fish flows, and channel losses. In most years, the amount available from the Mokelumne River is 325 MGD, the maximum allowed under its water rights. In periods of drought, or lower than normal rainfall, the available supply is less than the legal entitlement; and, if the demand for water at that time is greater than the available supply, then deficiencies will occur. These deficiencies must then be met by reductions in demand through conservation or, if necessary, rationing, or through development of additional supplies.

Pardee and Camanche Reservoirs, with a combined storage capacity of 640,800 acre-feet, provide ample water supply for protection against any single dry year. Normally, water not needed in one year can be held over for the following year to protect against a potential drought. As demands increase, the quantity available for carryover storage is reduced. Supply deficiencies begin to occur when two or more dry years occur in succession, depending on the level of average annual diversion going into the dry period.

As EBMUD's water requirements continue to rise, so will the risk and magnitude of a deficiency. Figure IV-6 illustrates the results of computer operations studies conducted which assumed aqueduct drafts of 166 MGD, 255 MGD, and 325 MGD for the period of record available (1907-1982). The studies assume estimated 2020 conditions along the Mokelumne River basin. Note that the number of years in which a deficiency occurs and the magnitude of the deficiency increase as demand increases.

The 1976-77 drought was more severe than any previous period of record. EBMUD diversions from the Mokelumne for 1977 averaged only 119 MGD. Even with water demand reductions of 39 percent in 1977 EBMUD still received emergency deliveries from the USBR contract supply. The 1976-77 experience, how ever, showed that during a drought it is possible to make substantial short-term reductions in water use. In the future, by recognizing the onset of a drought early and acting quickly to implement demand management measures, EBMUD could conserve limited water supplies and spread any deficiencies over a longer period of time to minimize the hardship incurred by customers.

Mokelumne Supply Availability — Figure IV-6



POLICY ON WATER SUPPLY AVAILABILITY AND DEFICIENCY

In May 1985, the EBMUD Board of Directors adopted a policy on Water Supply Availability and Deficiency. The purpose of the policy is to establish criteria for evaluating the adequacy of the District's water supplies and to provide for the following:

- Annual review of the water supplies available for the current and following year to meet the demand of EBMUD's customers;
- Annual review of the water supplies available for the long-term to meet projected increases in demand; and
- Case-by-case review of the water supplies available when considering decisions on requests for extension of service to annexations beyond the ultimate boundary and replacement supplies to other water agencies.

Figure IV-7 contains the policy adopted by the Board.

Acceptable Maximum Level of Demand

Allowable deficiency will be used as the basis for determining the long-term ability of EBMUD's water supplies to meet demand. The allowable deficiency is that level which would result in no greater deficiency to an average customer than that experienced during the 1976-77 drought, assuming that EBMUD reacts to the drought condition earlier than it actually did in 1976.

The allowable deficiency in conjunction with long-term estimates of other conditions affecting EBMUD's water supplies will determine the level of demand that should not be exceeded unless a supplemental supply is implemented.

Under present conditions the acceptable maximum level of demand is 240 MGD. That figure will be reviewed every year. As time passes, the acceptable maximum level of demand will probably decrease for two reasons. First, as greater water use efficiency is incorporated into the water supply system through the water conservation program it will become more difficult to achieve the water use reductions that were achieved during the 1976-77 drought. Second, increasing demands on the Mokelumne River and increasing channel losses below Camanche Reservoir will decrease the supplies available to EBMUD. Figure IV-8 illustrates the process for developing the acceptable maximum level of demand.

Actions Based on Evaluation

If long-term projections made in the annual report indicate that EBMUD's water supplies are projected to be inadequate to meet demand within the constraint of allowable deficiency then demand management measures, in addition to those scheduled to be implemented, and implementation of a supplemental supply will be considered.

DEMAND REDUCTIONS IN TIME OF DROUGHT

EBMUD's policy on Water Supply Availability and Deficiency requires an annual evaluation of the adequacy of EBMUD's water supplies to meet the demands of customers. The annual review will include a review of supply availability and deficiency for the current and following year. The analysis will address two specific questions:

- Is the current year water supply sufficient to meet the water requirements?
- Is the current year water supply high enough to avoid concern about the next year should that year be dry?

In the event that deficiencies are projected to occur in either the current year or the following year then appropriate demand management measures would be implemented. A District procedure is being established which will provide the specific water supply conditions (including elements such as storage, snowpack, projected runoff, and forecasted weather conditions) that would identify a drought situation as part of the annual review of water supplies. Based upon the current year forecast of deficiencies, EBMUD would recommend to the Board of Directors a level of reduction necessary and the actions required to bring about those reductions.

Specific recommendations would depend on many factors including current water storage, an-

EBMUD

Policy 52

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SUPERSEDES

WATER SUPPLY AVAILABILITY AND DEFICIENCY

IT IS THE POLICY OF THE EAST BAY MUNICIPAL UTILITY DISTRICT TO:

A. Evaluate the availability of the District's water supplies (supplies of the same or similar quality to that of the Mokelumne River supply) and determine the acceptable maximum level of average annual demand for the District's service area based on limiting the water supply deficiency in a repeat of 1976-77 hydrologic conditions to the percentage reduction in demand actually experienced by the average customer during the period of water rationing in 1977.

B. Review and report on the current and long term adequacy of the District's water supplies annually on or about April 15. The report shall include the acceptable maximum level of demand, projected water requirements, and the estimated surplus in supplies over and above the projected requirements.

C. Make projections of average annual demand for evaluating the adequacy of water supplies assuming:

- o Water service will be provided in response to reasonable requests for service to properties located within the District's service area.
- o Annexation of property within the District's ultimate boundary will be considered pursuant to normal District procedures in response to reasonable requests for service.
- o A water conservation program will be implemented as provided in the District's Urban Water Management Plan.

D. Review and report on the long term adequacy of the District's water supplies when considering case-by-case decisions on requests for replacement supplies which would increase the average annual demand by one percent or more; or, annexation beyond the ultimate boundary.

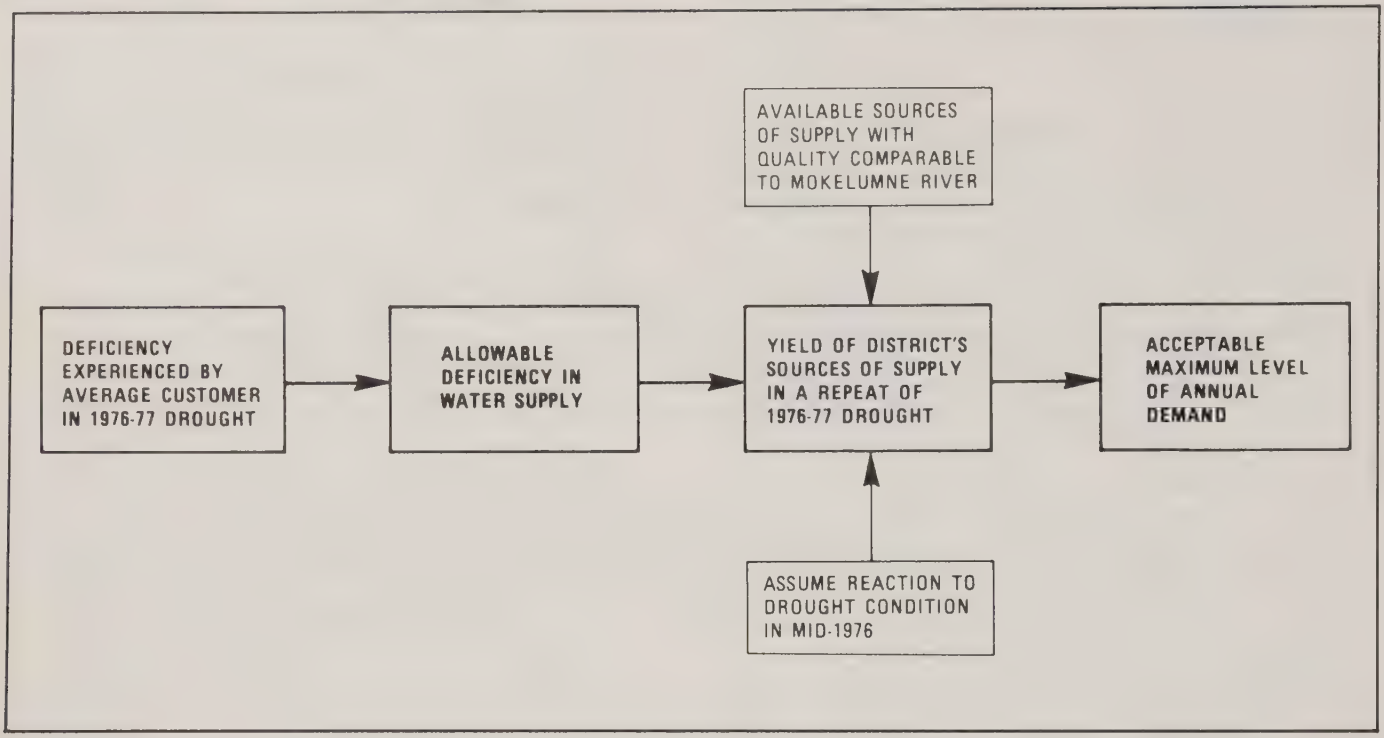
- o A request for annexation beyond the ultimate boundary for extension of water service to new development will be considered only if it represents the most practical and feasible method of obtaining service and the acceptable maximum level of average annual demand is not exceeded.
- o A request for a replacement supply for another water agency will be considered only if the other agency maintains a reliable alternative source of supply. This requirement may be waived at the discretion of the Board of Directors when the replacement supply is needed because of serious water quality problems or for public health reasons.
- o District Policy on Effects of Extension of Water Beyond the Ultimate Boundary shall be applicable in each case.

E. Consider appropriate demand management measures and/or implementation of a supplemental supply if existing supplies are found to be inadequate. In the event that demand management measures and the availability of supplemental supplies fail to result in a supply adequate to meet projected demand, equitably allocate the limited amount of excess supply in consultation with affected cities and counties.

Reference: Board Resolution 31,246, May 14, 1985

Determining the Acceptable Maximum Level of Demand

Figure IV-8



ticipated runoff, level of current demand, effectiveness of existing conservation measures, and the public's awareness or perception of the problem. Figure IV-9 illustrates the steps involved in implementing short-term demand reducing measures.

Table IV-2 shows a list of potential demand reducing measures that could be considered for implementation. The measures, as presented in this table, are in general terms to provide an idea of the kinds of measures that would be proposed. Specific details and the effort required for each measure would be included in the recommendation to the Board of Directors and would depend on the actual circumstances.

EMERGENCY INTERRUPTIONS OF SUPPLIES

EBMUD recognizes that there are situations that could cause the failure of major supply facilities resulting in a temporary loss of water supplies. Failures could result from earthquakes, floods, landslides, toxic spills, or other incidents.

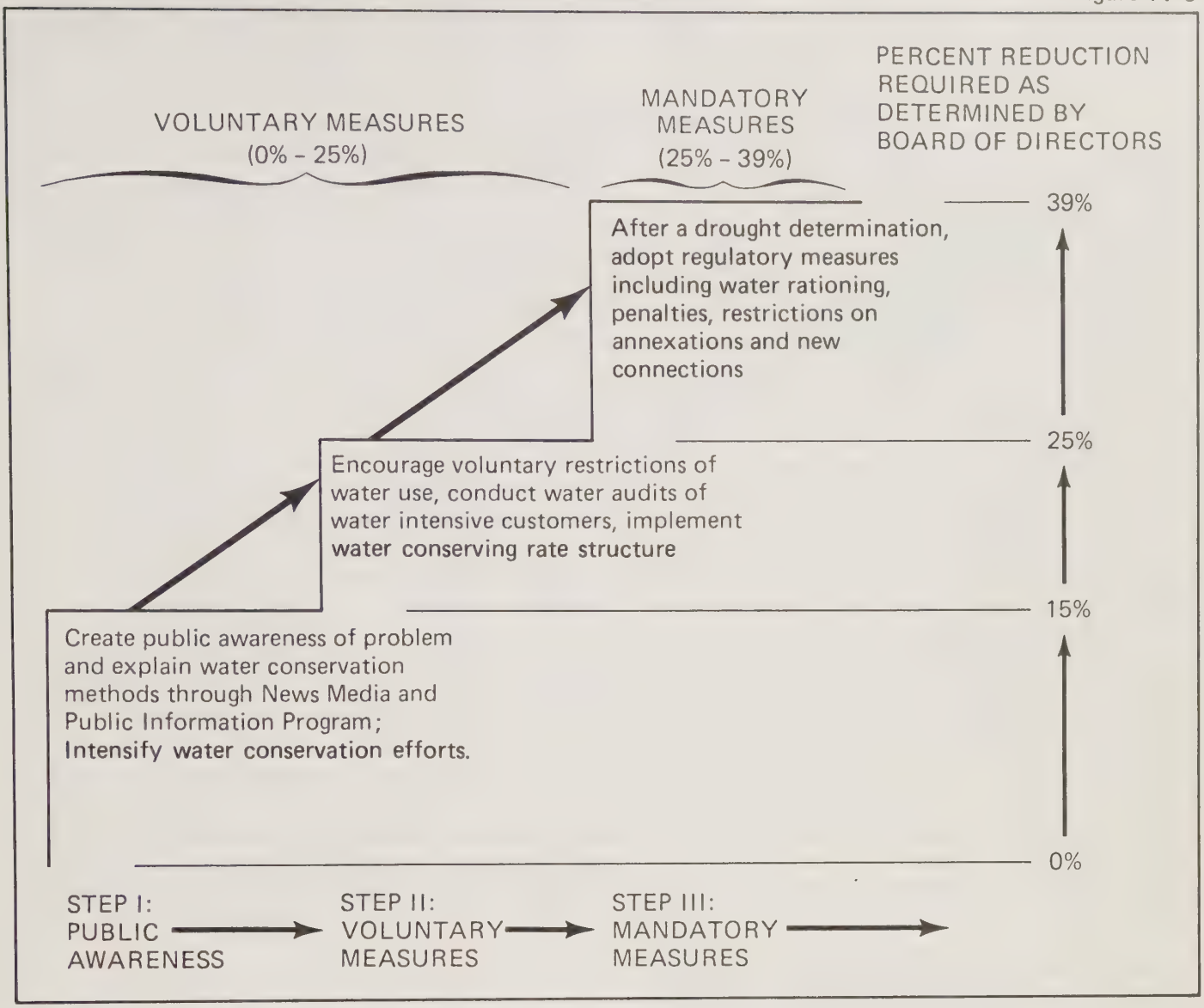
Figure IV-1 shows the major facilities within the service area. The failure of any of these facilities could result in water outages for all or part of EBMUD's service area. Currently, EBMUD is updating its Emergency Plan which describes how it would respond to emergency situations.

EBMUD stockpiles sections of pipe and other materials that could be used in an emergency situation to repair damaged facilities and restore water service. EBMUD's terminal reservoirs provide emergency standby storage. In the event of a failure of raw water facilities from the Mokelumne, the terminal reservoirs could provide water to District customers for 6 to 12 months.

The section of the Mokelumne aqueducts that crosses the Sacramento-San Joaquin Delta has been identified as vulnerable to flooding and earthquake events which could cause extensive damage. The problem is caused by degradation of the levee system and the unstable nature of the soils in the Delta. It is estimated that the worse case earthquake would cause an outage of the Mokelumne aqueducts of up to 33 months. Figure IV-

Phases for Short-Term Demand Management

Figure IV-9



10 shows the section of the aqueducts that crosses the Delta.

The Water Action Plan will evaluate specific alternatives to guarantee the security of the District's water supplies.

NEED FOR ADDITIONAL SUPPLIES

As previously described in this chapter, EBMUD evaluates the long-term adequacy of water supplies based on the concept of allowable deficiency. Allowable deficiency is that level which results in no greater deficiency to an average customer than that experienced during the 1976-77 drought, assuming EBMUD reacts to a drought earlier than it actually did in 1976. Based on an allowable deficiency of 25 percent in the last half of 1976, and 39 percent in 1977, the acceptable maximum level of demand is 240 MGD under current conditions. This level of demand should not be exceeded unless EBMUD implements additional water supplies.

Current projections indicate that without additional water conservation, a supplemental water supply would be required near 2000. Assuming the acceptable maximum level of demand remains

Potential Measures for Short-Term Demand Management Table IV-2

MEASURES	PERCENT REDUCTION REQUIRED		
	0-15%	15-25%	25-39%
VOLUNTARY:			
1) Explain problem and objectives to media and public through press release, and news conference.	●	●	●
2) Intensify public information program.	●	●	●
3) Intensify water conservation efforts including incentive measures.	●	●	●
4) Promote voluntary program for limited outside water use.		●	●
5) Expand water audits of water-intensive customers.		●	●
6) Send letters to customers requesting conservation.		●	●
7) Change rate structure to encourage conservation.		●	●
MANDATORY:			
8) Implement water rationing program			●
9) Asscess penalties for excessive water use			●
10) Prohibit new annexations			●
11) Prohibit new connections			●

at 240 MGD, the expanded water conservation program described in Chapter VI would delay the use of supplemental water supplies by about 10 years, as shown in Figure IV-11. However, increased water use efficiency may make dry year reductions more difficult to achieve thus decreasing the acceptable maximum level of demand. EBMUD will evaluate the impact of increased conservation on the acceptable maximum level of demand in its annual report on water availability. The water conservation program may provide additional lead-time for implementing a supplemental supply but will not preclude its eventual need.

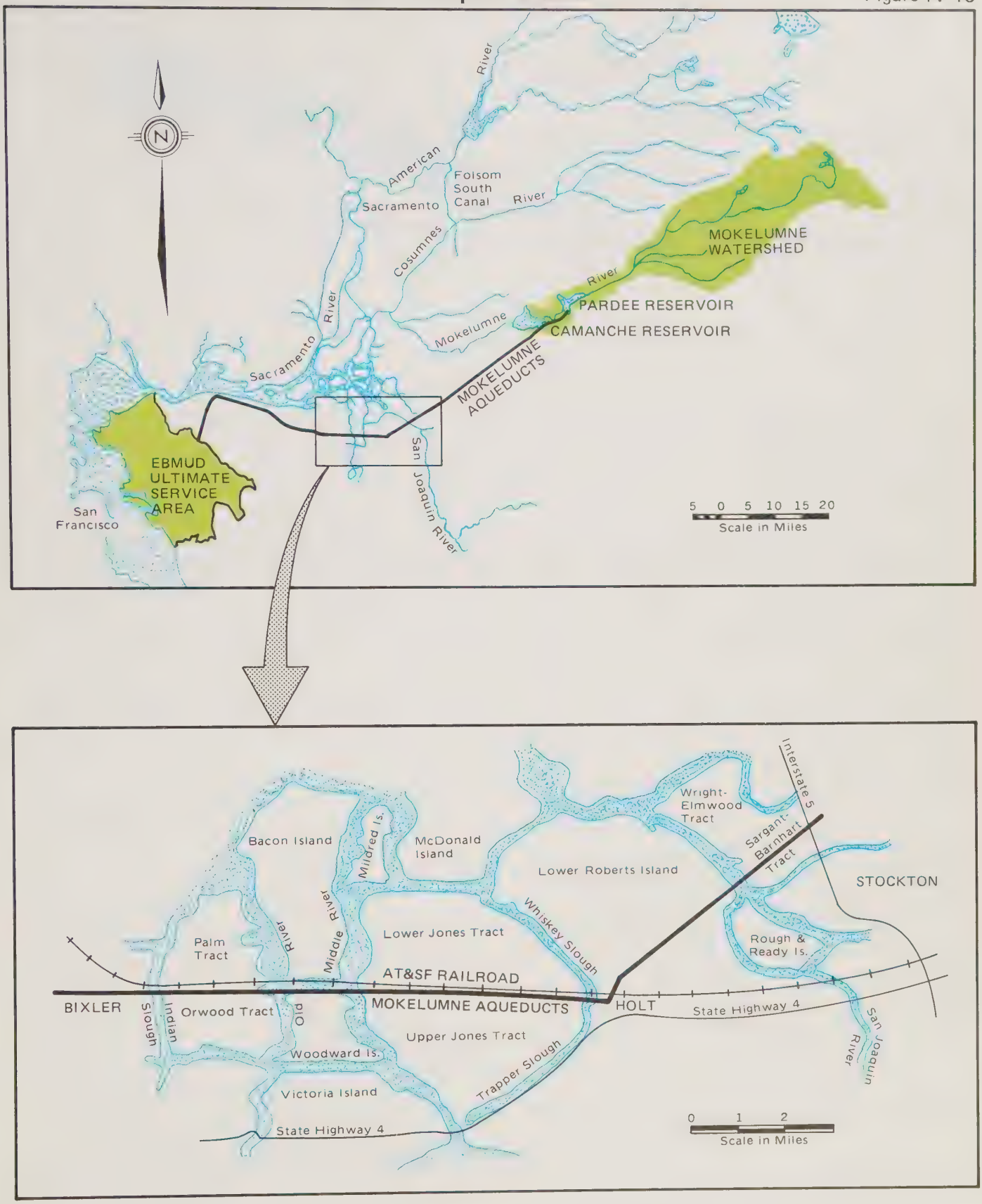
In the event that the water conservation program and the availability of supplemental water supplies fail to result in a supply adequate to meet projected demand, EBMUD will equitably allocate the limited amount of excess supply in consultation with affected cities and counties.

Water Conservation and Development Fund

EBMUD is in the process of establishing a fund to be used to assist in the financing of measures to increase the available water supply. This fund may be used to implement water conservation measures or to develop wastewater reuse projects or water supply improvements. Revenue for the fund may be from annexation fees and/or an additional component in the System Capacity Charge paid by all applicants for water service.

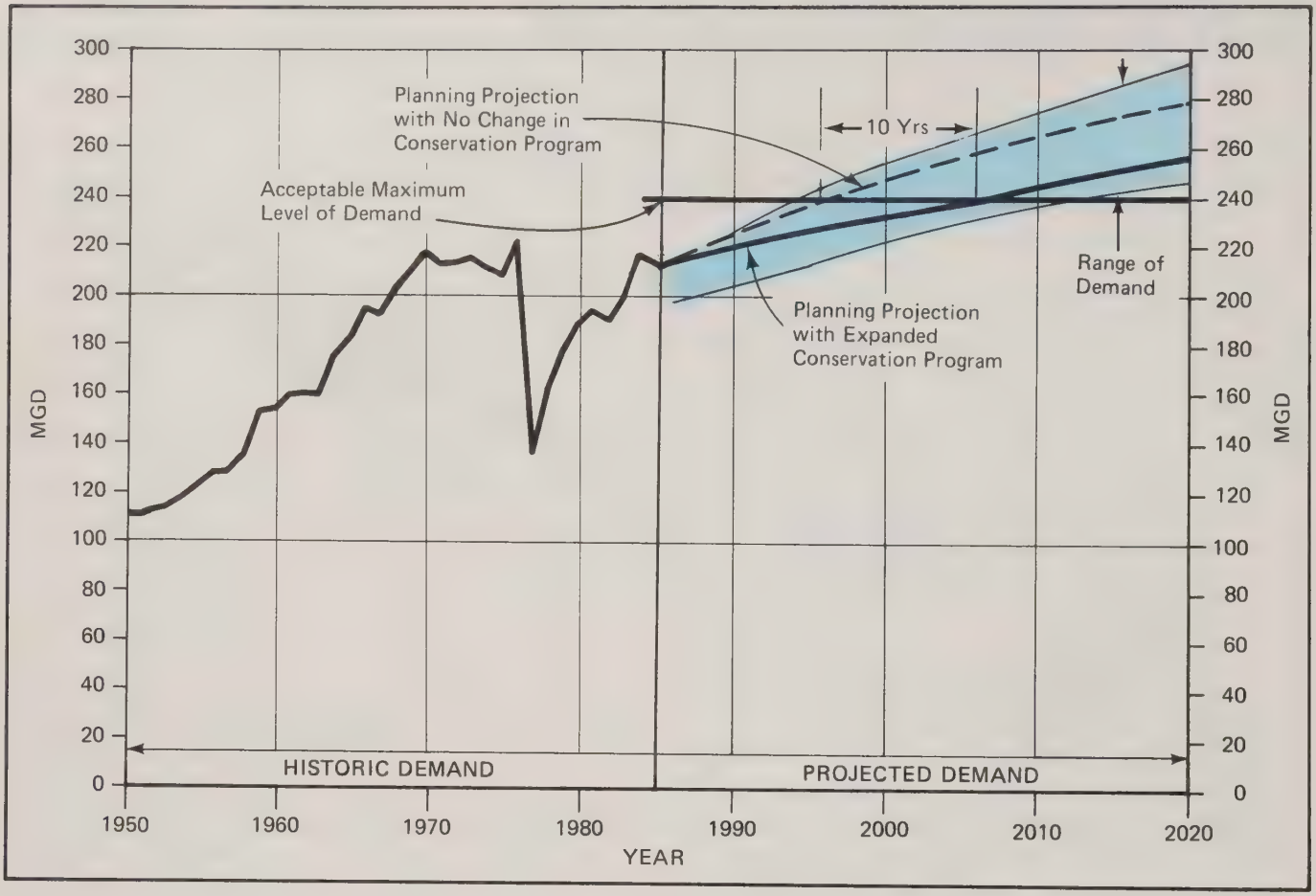
Portion of Mokelumne Aqueducts Which Cross the Sacramento–San Joaquin Delta

Figure IV-10



Impact of Water Conservation on Projected Demand

Figure IV-11



Chapter V
Current Water Conservation Program

Water conservation was adopted as a formal element of EBMUD's water management policies in 1972. Conservation was intended to decrease water demand and to delay the need for future supplemental water supplies. To this end, EBMUD developed a series of informational materials in order to foster public awareness of water and its use. In addition, EBMUD initiated measures to reduce its own consumption of water.

This chapter summarizes the historical development of water conservation at EBMUD, including the impacts of the 1976-77 drought. In addition, EBMUD's current water conservation program is described in detail.

HISTORY OF WATER CONSERVATION AT EBMUD

As described in Chapter III on Water Use, water consumption by EBMUD customers increased dramatically during the 1950's and 1960's. In 1950 water use averaged 111 MGD, in 1960 it increased to 154 MGD, and in 1970 water use climbed to 218 MGD. The rapid increase in water use created concern about EBMUD's ability to meet future demands with existing supplies. One result of this concern was the adoption of a water conservation program in 1972.

EBMUD's early water conservation efforts were aimed at developing a long-term awareness of water and its efficient use. A series of informational materials such as brochures, bill inserts, posters, and educational publications for schools were developed in order to foster a public awareness of water and its use. Water use did level off in the first half of the 1970's, although other factors such as weather, economics, and public environmental awareness, undoubtedly contributed to the slowdown in the growth of consumption.

In addition to informational programs, EBMUD also took measures to reduce its own consumption of water. The distribution system was surveyed for leaks, operations were modified, and facilities were installed to reclaim washwater from filter plants. These supply management efforts have become standard practice and have increased the efficiency of operations.

Although the conservation information and materials produced by EBMUD before the drought were prepared for gradual education and not for emergency purposes, they proved to be very valuable when the water shortage developed in 1977 and rationing was implemented. Because much of the information and printed material demanded by the public was readily available during the early months of 1977, EBMUD was able to respond quickly. This response established EBMUD credibility with the public that made possible the success of the rationing program.

WATER CONSERVATION DURING THE 1976-77 DROUGHT

The 1975-76 and 1976-77 runoff seasons produced the worst continuous dry period ever re-

corded in the service area and in the Mokelumne watershed, where EBMUD obtains about 95 percent of its water supply. Similar effects were felt throughout Northern California communities. During this drought period water conservation became a critical component of EBMUD's response to dwindling water supplies. In June of 1976, EBMUD asked customers to voluntarily conserve water; by early 1977 mandatory conservation was necessary and customers responded by reducing consumption by 39 percent for that year.

The success of rationing depended on voluntary compliance, for it would not have been possible to enforce regulations effectively if noncompliance were widespread. Even though the emergency supply of water from Middle River in the fall of 1977 was a key element in EBMUD's operations during the drought, it was the public's response to rationing that made the essential difference in managing the available water supplies.

Customers responded well to the conservation program, and as a whole reduced water use more than was requested. Industrial and institutional customers became more efficient in their water use by installing new equipment and devices, repairing leaks, and modifying existing processes to achieve their water use goals. Many residents installed water saving devices in water closets and showers, recovered grey water for garden use, or drastically reduced or eliminated residential landscape irrigation. Ceasing landscape irrigation caused substantial loss of lawns, shrubs, trees, and property value for many EBMUD water customers.

Although the drought ended in January of 1978, public awareness of water conservation had a long-term effect on reducing water demand. While much of the water conservation efforts resulted in short-term reductions such as habit changes, many of the structural changes such as the installation of water saving devices or technologies, resulted in long-term water use reductions. This long-term efficiency is now built into customers water use patterns. Even though water demand is increasing, there is greater efficiency in how the water is used.

Industrial water use has remained steady at about 75 percent of 1975 levels since the drought. The difference between residential and industrial categories of use reflects the difference in conservation methods used during the drought. Industrial customers generally made permanent operational and plant modifications to reduce water use, and higher costs for wastewater treatment have provided an additional incentive to continue saving water. On the other hand, residential and commercial customers, which together use about two-thirds of the water supplied by EBMUD, saved the most water by reducing landscape irrigation during the drought. As lawns and gardens have been replaced and restored, and as the memory of rationing recedes, water use has increased. In fact, overall District water use has now reached pre-drought levels.

At the end of rationing in February 1978, EBMUD significantly reduced its water conservation activities. The emergency was over, East Bay water users had given excellent cooperation, and water use was far below pre-drought levels. In the transition period immediately after the drought, continued insistence on water conservation was not needed.

CURRENT WATER CONSERVATION PROGRAM

With the increase in water consumption back to pre-drought levels, the need for water conservation has returned. In recent years EBMUD has increased efforts to encourage efficient use of water by customers. In 1984, EBMUD hired a Water Conservation Administrator to further develop, implement, and administer a long-term conservation program. Currently, EBMUD has a broad range of conservation measures in effect which include both supply and demand management.

Supply management measures are those actions the District takes to make the water supply system as efficient as possible. These efforts include leak detection and pressure reduction. In addition, the District is encouraging reclamation projects in an effort to reuse water supplies and reduce the need for fresh water by reclaiming wastewater.

Demand management measures include programs designed to encourage customers to reduce their water usage either through education, which creates a conscience for water and its use, or by encouraging the use of water-saving technology and water-saving devices. EBMUD's current water conservation program is summarized below.

Demand Management

EBMUD's demand management measures are intended to create an awareness of water use and encourage customers to reduce their water usage. Demand management covers a wide range of efforts ranging from providing educational material for school children to establishing a water rate structure that encourages water conservation.

SCHOOL EDUCATION PROGRAM

Out of the District's increased effort in water conservation in the early 1970's came the development of a school water education program called Project WATER (Water Awareness Through Education and Research). By the fall of 1984, EBMUD had produced and distributed over 400,000 student workbooks, 12,000 teachers' guides and other classroom aids to schools in EBMUD's service area. In addition, schools outside the service area, in California and across the nation, bought more than 1.4 million items from the Project WATER materials.

The financial return from sales outside EBMUD has served to offset the costs of producing the materials and distributing them within the service area. In the process, Project WATER became a model for the approach and format of educational programs developed by local utilities and state water agencies, not only in California but throughout the country. During 1981 and 1982 the District spent approximately $60,000 to revise the *Captain Hydro Water Conservation Workbook* and teacher's guide and to produce a new teacher's guide, for *Water Play* and a *Resource* insert for local users of the materials.

EBMUD currently uses the services of an educational consultant to promote and distribute school educational material. The program is administered by EBMUD's Public Information Office, Public Education Program. It is expected that income from outside the District will once again defray the costs of developing and producing the program within the service area. Table V-1 summarizes the school material that has been distributed to date.

PUBLIC INFORMATION

Water conservation efforts that fall under the category of public information cover a broad range of programs and services which are intended to help inform the general public of the importance of conserving water. The public information programs include:

- Speakers Bureau — EBMUD provides speakers from its staff to give water conservation presentations; generally, the presentations are given to service organizations, schools, church groups, and garden clubs.
- Exhibits — EBMUD participates in a number of community events, including the Festival on the Lake in Oakland and the BAEER Fair (an environmental education fair) on Treasure Island. Water conservation exhibits are set up and staffed by EBMUD personnel.
- Brochures and Posters — EBMUD prints several water conservation brochures and posters covering a wide range of topics ranging from Sunset magazine reprints to a cookbook titled *Mother Mud.*
- Bill Inserts — Water conservation tips and information are periodically included in customer bills.

Summary of School Material Distribution Since 1976

Table V-1

PUBLICATION	DISTRIBUTION
Captain Hydro	102,000
Water Play	98,200
Water, Where	87,200
Water Conservation – High School Series	65,900
Tardy Twins	18,600
Further Adventures	11,300
Captain Tlaloc (Spanish)	12,100
Hydro Poster	5,100
Teacher's Guide	12,000

DEMONSTRATION GARDENS

In August 1981, the Board of Directors authorized a residential landscape water conservation demonstration garden pilot project. The goal of the project was to retrofit three residential front yard gardens to demonstrate the attractiveness, low water use, and low maintenance needs of drought-tolerant landscaping. Homes were chosen in Berkeley, Lafayette, and Moraga. The front yards were landscaped by three different landscape architects to show a variety of ways to work with drought-tolerant plants.

The garden installations were completed in October 1983. Even though 1984 was hotter and drier than normal, causing demand to rise approximately 10 percent District-wide, water use for the demonstration gardens dropped nearly 45 percent from the previous four-year average. By fall 1986, when the gardens are fully established, water savings are projected to be even greater. Figure V-1 shows the water savings achieved from the demonstration gardens.

EBMUD has been publicizing the gardens for public viewing since the spring of 1985 through newspaper articles and other media channels. The homeowners keep weekly logs of the time they spend weeding and other maintenance, and monitor water use. EBMUD plans to continue to monitor and evaluate the demonstration gardens for several years.

In addition, a Resource Garden, installed at Lake Merritt in Oakland in 1982, is part of a cooperative effort between EBMUD, the City of Oakland, the State of California, and the U.S. Environmental Protection Agency. The garden is a demonstration site showing the use of composted sewage sludge, low water using plants, and efficient irrigation systems.

WATER CONSERVATION DEVICE DISTRIBUTION

EBMUD distributed water saving kits during the 1976-77 drought and since then has continued to participate in the distribution of kits. These kits, which have been obtained from the State Department of Water Resources since 1978, include a showerhead insert which reduces the flow to about 3.0 gallons per minute (gpm), a water bag for the water closet which saves 0.7 gallons per flush, and two dye tablets to test for toilets leaks. It is estimated that EBMUD has distributed over 200,000 of these kits within the service area since 1978.

PRICING

In theory, an increase in the price of water should lead to a reduction in demand for that water. Many attempts have been made since the early 1950's to correlate changes in the unit price of water to changes in water use, with varying degrees of success.

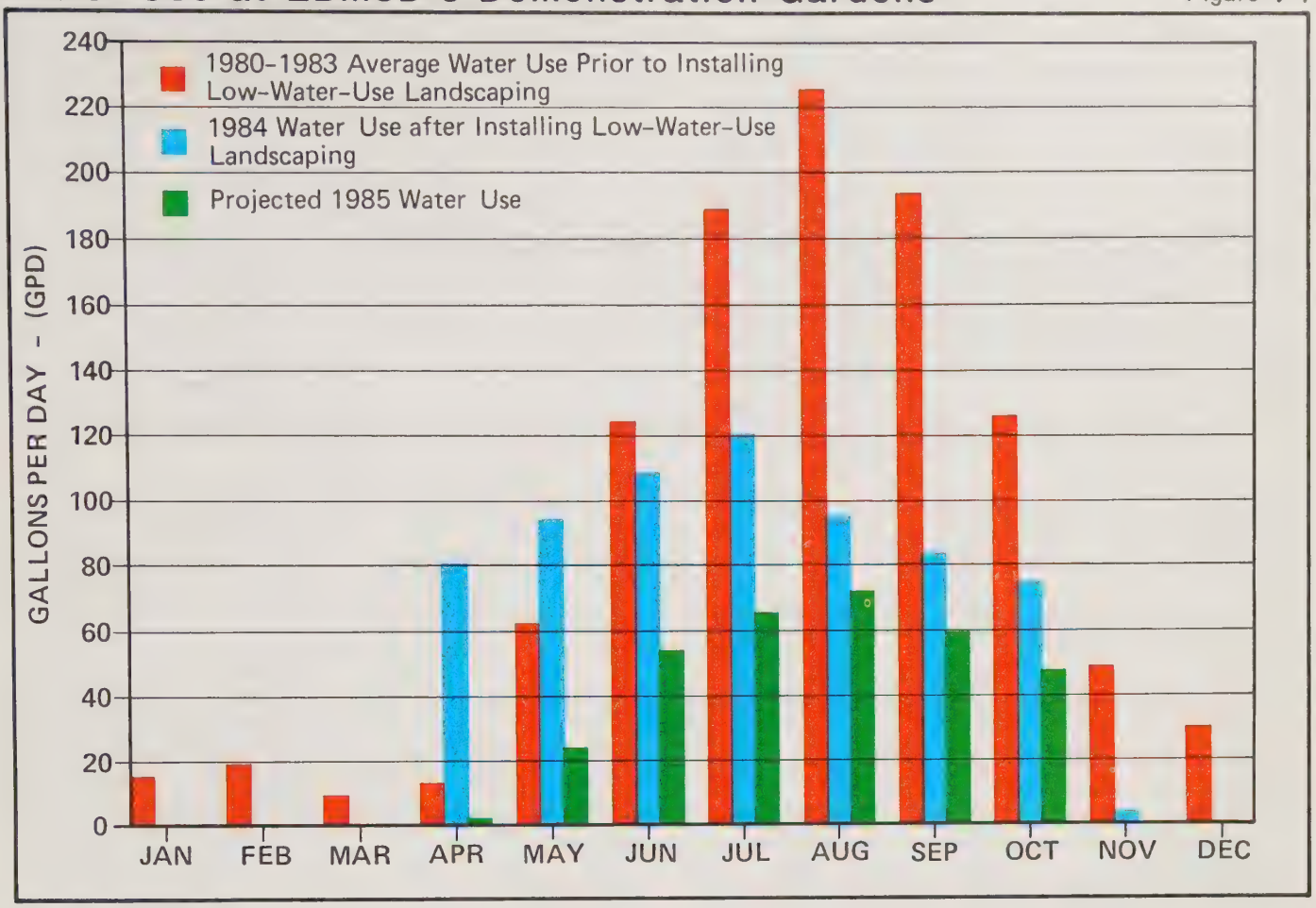
In the summer of 1973, EBMUD's Directors authorized a comprehensive study relating to water consumption patterns and water pricing policies. The firm of R. W. Beck and Associates was retained in 1975 to assist in this study, particularly with respect to water price elasticity for single-family residential customers. The results, summarized in a July 1977 EBMUD report titled "Water Pricing and Consumption Study," states that "price elasticities in the neighborhood of $-.15$ to $-.3$ are probably the best estimates that can be derived from the District's historical data." In other words, a 10 percent increase in the price of water might be expected to lead to a 1½ to 3 percent decrease in water use.

U.S. Army Corps of Engineers publications prepared in 1978, which were combined and rereleased in 1981 by the American Public Works Association (APWA) as "Special Report #48: Planning and Evaluating Water Conservation Measures", draw a similar conclusion. The investigations listed in Table V-2 were compared, and, in spite of wide variations attributed to sample size and other factors, all were found to show that consumers actually do respond to changes in water price, and that in general, outside (irrigation) water use is more elastic than inside water use.

The APWA report noted that some investigations employed cross-sectional analysis techniques while others utilized time-series techniques. Time series analyses involves observations of water use and explanatory variables (price, rainfall, temperature, income, etc.) over a long period of time at the same location. Cross-sectional analysis involve simultaneous observations of water use and explanatory variables at several locations during a single time period. Time-series

Water Use at EBMUD's Demonstration Gardens

Figure V-1



estimates can be used to estimate both short-term and long-term effects on water use, while cross-sectional estimates are indicative of long-run effects. The report estimated short-run price elasticity to be about −0.1 and long-run price elasticity to be more nearly −0.4. (A 10 percent increase in the price of water might be expected to reduce water use by 1 percent initially and by 4 percent eventually.)

Both the EBMUD report and the APWA report discuss the difficulties in deriving price elasticity values because of the variety of factors involved in addition to price changes (income variations, population changes, weather conditions, etc.).

The APWA report also discusses factors which might prevent price increases from producing decreases in demand. The price changes must be real (not the result of general inflation) to have any effect. According to the APWA report, if the rate structure is other than a simple uniform price, consumer response is less predictable. The fact that water represents a very small portion of most consumers' budgets minimizes the importance of price changes to consumers. Finally, the APWA report notes that reductions in water use attributable to a price increase and reductions resulting from the installation of water-saving devices often cannot be separated since one of the major components of price related reductions is the installation of water-saving devices.

EBMUD's commitment to investigate pricing policy as a water conservation measure is partially responsible for changes in EBMUD's rate structure effective August 1, 1985. The new rate structure has been changed from a declining block rate

Estimated Elasticities of Demand for Water

Table V-2

INVESTIGATOR	YEAR	TYPE OF ANALYSIS	PRICE ELASTICITY
Gottlieb	1952	68 Kansas cities	-1.02
	1952	19 Kansas cities	-1.24
	1957	84 Kansas cities	-0.69
	1957	24 Kansas cities	-0.68
	1958	24 Kansas cities	-0.66
	1963	Kansas Cross-Sectional	-0.95 (mean)
Seidel and Baumann	1957	American cities, cross-sectional @ .45/1,000 gal.	-0.12
Renshaw	1958	36 water service systems, cross-sectional	-0.45
Fourt	1958	34 American cities, cross-sectional	-0.39
Heaver and Winter	1963	Ontario cities	-0.254
Wong, et al.	1963	Northeastern Illinois, cross-sectional	-0.31 (mean)
Hedges and Moore	1963	Northern California irrigation	-0.19
Howe and Linaweaver	1963-65	21 residential domestic	
		Public sewers	-0.23
		Seasonal use	-1.16
Gardner and Schick	1964	42 northern Utah water systems, cross-sectional	-0.77
Flack	1965	54 Western cities, cross-sectional @ .45/1,000 gal.	-0.12
		All cities @ .45/1,000 gal.	-0.65
Ware and North	1965	634 Georgia residences	-0.67
Bain, Caves and Margolis	1966	41 Northern California cities	-1.10
		Irrigation	-0.64
	1966	41 California cities, cross-sectional	-1.099
Burns, et al.	1970's	Stratified two-price comparison	-0.20 to -0.38 in house -0.27 to -0.53 sprinkling
Young, R. A.	1973	Tucson time-series, 1946-1971	-0.20 (reanalysis)
Pepe, et al.	1975	4 South Carolina cities, 2 and 3 year time series	0.00 to -0.51
Grunewald, et al.	1975	150 rural Kentucky, cross-sectional	-0.92
Hogarty and McCay	1975	Blacksburg, VA, 2 year time series	-0.50 to -1.40
Camp, R. C.	1978	228 Mississippi households, cross-sectional	-0.24 to -0.31
Carver, P. H.	1978	13 Washington, D.C. utilities, 6 year time series, cross-sectional	0.00 to -0.1 (short run)
	1978	Fairfax Co. (VA) 4 year time series of an innovative price structure	-0.02 to -0.17
Turnovsky	1969	Industrial Massachusetts, cross-sectional	-0.47 to -0.84
DeRooy	1974	New Jersey chemical, cross-sectional	-0.89 cooling -0.74 processing -0.74 steam generation
Lynne, et al.	1978	Miami, FL, cross-sectional	-0.33 dept stores -0.89 grocery stores -0.14 to -0.30 hotels eating and drinking: not significantly different from zero
Conley	1967	24 Southern California communities, cross-sectional	-0.625 (mean)
Turnovsky	1969	19 Massachusetts towns, cross-sectional	-0.225 (mean)
Bruner	1969	Phoenix	-0.33
Grima	1970	91 observations, cross-sectional	-0.93
	1972	Ontario cities, winter	-0.75
Wong	1970	Chicago, 1951-61, times series	-0.15 (mean)
		Four community size groups, cross-sectional	-0.54 (mean)
Ridge, R.	1972	Industrial, cross-sectional	-0.3 malt liquor -0.6 fluid milk processing
Leone, Ginn and Lin		Industrial, cross-sectional	-0.3 to -0.4 paper -0.7 to -0.4 chemical -0.5 to -0.4 petroleum -0.7 to -1.1 steel

Source: Amended from U. S. Army Corp, 1976

to a single volume rate. In addition, the fixed monthly service charge has been reduced, thus requiring an increase in the volume charge. As a result, the cost of water use delivery charges in the range of 500 to 50,000 cubic feet of water per month has increased by about 3.6 percent, and for use over 50,000 cubic feet per month has increased by nearly 17.4 percent. The new rate structure includes a discount of one dollar per month for all customers who use less than 1,000 cubic feet of water in that month.

EBMUD's rate schedules also impose elevation surcharges for service to higher pressure zones because pumping costs are greater to serve those zones. The elevation surcharges, which can increase the basic water delivery rate by as much as 47 percent, may have an incidental water conservation effect, but are primarily intended to instill greater energy cost awareness among water users in the higher zones. Preliminary evaluation of the elevation surcharge has shown no perceivable effect on water consumption.

EBMUD is committed to continuing the investigation of using pricing as a water conservation measure and is currently studying various seasonal pricing alternatives as a means of reducing outside (irrigation) demand during the summer months.

REGULATIONS

In 1977, during the drought, EBMUD established Section 28 of its "Regulations Governing Water Service to Customers" to provide restrictions and guidelines for water use during the water shortage emergency condition declared by the Board of Directors. The purpose of the regulation was to conserve the water supply for the greatest public benefit, with particular regard to domestic use, sanitation, and fire protection. Customers were urged to voluntarily conserve water and to observe specific restrictions on water use. In a similar situation in the future such regulations could again be established. Further details of EBMUD's response to drought or emergency shortages is discussed in Chapter IV.

Supply Management

EBMUD's supply management efforts are intended to maximize the efficiency of the water supply system by reducing water losses, minimizing operational losses, and maintaining a consistently reliable water supply for customers at the lowest cost. EBMUD is also studying potential reclamation projects in an effort to complement existing supplies and reduce the need for fresh water from the Mokelumne and other sources. Currently, EBMUD is reclaiming about 5 MGD from water and wastewater projects.

LEAK DETECTION AND PREVENTION

EBMUD has an extensive program designed to reduce unaccounted-for water losses, including locating and eliminating leaks as well as a preventative program of corrosion control, and meter and valve maintenance to reduce the occurrence of new problems.

Unaccounted-for water is the difference between the quantity of water delivered into the distribution system (gross water use) and the metered and estimated consumption by customers and EBMUD. Gross water use is the total of water treatment plant production, raw water distributions from the aqueducts, and estimated groundwater inflow to the Claremont Tunnel, less water treatment plant washwater taken from the treated water distribution system, adjusted for any gain or loss in treated distribution storage. Metered consumption includes all residential, commercial, institutional, industrial, and other metered water consumption within EBMUD's service area, plus metered water delivered to customers served outside the service area. EBMUD use includes estimated unmetered treated water for the following:

- Administration buildings, business office and corporation yards, soils and water treatment plant laboratories, including landscape irrigation;
- Leakage from tanks, reservoirs, pumping plants, water treatment plants, water treatment plant sample taps, and estuary crossing;

- Washing of reservoirs, draining tanks, aqueducts and mains including blowoff and chlorination of mains; and
- Main breaks and construction damage, and pumping plant cooling water.

The distribution network includes 3,550 miles of pipe, 118 pumping plants, and 156 reservoirs. EBMUD surveys nearly 1,700 miles of pipe each year for leaks.

Several techniques are used to locate leaks in this expansive network such as visual inspection, leak detection equipment and record-keeping of leak investigations. Since 1969 annual reports summarize the monitoring program findings. Records indicate leak frequency decreasing each year from 1,252 in 1977 to 714 in 1980. The following information is recorded of each investigation:

- Part of the main damaged and cause of the damage;
- Repairs made and inspector's recommendation;
- Size and type of leak;
- Type of soil, surrounding conditions and depth of cover;
- Type of corrosion; and
- Whether a magnesium anode was installed. A 25-year history of pipe replacement is shown in Table V-3.

A major effort to catch up with pipe replacements occurred during the 1960's. This effort has now tapered to a rate averaging about 7.5 miles per year which is determined to be consistent with the age of the pipe.

EBMUD also has an active corrosion control program. There are 145 impressed-current cathodic protection stations on the distribution system, and some 4,500 magnesium anodes installed on cast iron and steel mains. This program has resulted in a significant reduction in the leak rate of cast iron and steel pipe, and has resulted in a savings of over a half million dollars a year in leak repair costs since 1977. Internal corrosion and deposition is also controlled. Lime is added into the water system to raise the pH level to minimize internal corrosion. Designs are carefully checked to select proper coatings, materials, and paints for all structures to prevent corrosion.

Under-registration of customers' meters is another cause of unaccounted-for water. EBMUD has a meter maintenance program to more accurately measure metered water use and reduce unaccounted-for water as well as reduce the amount of lost revenue from faulty readings. EBMUD has 325,800 active metered services. The size, type, location, service pressure, and age of the meters are recorded, and valves are inspected on a regular basis to minimize water losses. The program includes verifying the location, operations, size and condition of the valve.

METERING

EBMUD's water service regulations require all water services to be metered. In some cases, a single meter may serve several customers at one property, such as apartments, condominiums, or mobile homes. Portable meters are provided to contractors for use at construction sites.

Metering improves water use efficiency in several ways. First, metering permits water audits which can result in the discovery of system leaks. Second, nation-wide studies comparing metered water use to unmetered water use show an average reduction of water use in the metered sector of 20 percent. The effect of customer metering is to reduce the amount of water used for landscape irrigation and hasten repairs.

PRESSURE REDUCTION

The rate of flow of water at an outlet or water fixture in the full open position is affected by the pressure in the water distribution system. For the same size outlet, lower pressure produces lower flow rates. Water uses which require a specific quantity of water, such as filling a bathtub, a toilet tank, or a washing machine, are not affected by pressure. However, water uses which are more time dependent, such as taking a shower or watering a lawn, could have the quantity of water reduced by reducing the pressure and thus the flow rate. This is particularly true where a slight change in flow rate is not usually noticeable.

A recently published nation-wide residential water use study has shown that a 30 to 40 pounds

Pipe Replacement

Table V-3

YEAR	MILES	YEAR	MILES
1961	40.18	1973	6.34
1962	25.45	1974	8.46
1963	27.39	1975	6.14
1964	27.65	1976	7.15
1965	17.65	1977	5.51
1966	23.21	1978	2.85
1967	24.68	1979	2.41
1968	25.11	1980	5.43
1969	15.24	1981	8.70
1970	13.61	1982	9.19
1971	10.20	1983	8.06
1972	10.66	1984	6.17
		1985	8.23

per square inch (psi) pressure reduction results in a 3 to 6 percent reduction in water use. This study was prepared, in 1984, by Brown and Caldwell for the U.S. Department of Housing and Urban Development and entitled *Residential Water Conservation Projects — Summary Report.*

EBMUD's distribution system is divided into 117 separate pressure zones because of topography of the service area, which ranges from sea level to elevation 1,450 feet. Each zone has one or more storage reservoirs to provide water for fire protection, for emergencies when the supply to the zone may be cut off, and for helping to supply the zone during peak demand periods. Storage reservoirs are located 100 feet higher than the highest service elevation in the pressure zone.

The Central Pressure Zone is the largest zone and accounts for 60 percent of the EBMUD demand. It serves an area between sea level and elevation 100 feet along the east shore of San Francisco Bay, from Richmond south to San Lorenzo. Water pressure ranges from about 40 psi at elevation 100 feet to about 85 psi at sea level.

The other pressure zones account for 40 percent of the demand and more typically serve an elevation range of 200 feet, stair-stepped in the system. The range of water pressure in these zones is typically about 40 psi at the highest pressure service elevation in the zone and 130 psi at the bottom of the 200-foot range.

The simplest way to reduce water pressure within the zones would be to lower the water surface elevation in the storage reservoir(s). If the surface elevation were lowered by 20 feet, a customer with a normal pressure of 85 psi would experience a 10 percent pressure reduction, and the flow rate at that customer's faucets would be reduced by about 5½ percent. Pressure at the highest service elevations in the pressure zone would drop below about 40 psi under static conditions and below 30 psi during peak demand periods, which is not acceptable for water service. Flow from all fire hydrants in the zone would also be reduced; however, an even more serious consequence would be that most of the zone's water storage would be eliminated, since distribution system reservoirs are typically only 20 to 30 feet deep. This situation could not be tolerated.

Pressure within the zones could be reduced with pressure regulators within the distribution system at the lower elevations of the pressure zone, which would allow the reservoir's full storage potential to be utilized. However, flow from all fire hydrants in the areas of reduced pressure would still be affected. In some cases flow rates could be restored to acceptable levels by installing larger pipelines at a significant cost to reduce pressure losses.

To avoid any compromise of the pressure zone's fire-fighting capabilities, pressure regulators on individual service laterals would be more appropriate. Plumbing codes already require water pressure regulators at service entrances where the pressure exceeds 80 psi, but this requirement has not generally been enforced by city and county building inspectors. EBMUD identifies this requirement when it prepares agreements for water main extensions to serve new developments. More rigorous enforcement of that plumbing code requirement would reduce water consumption in the affected households.

Low-flow showerheads and drip irrigation systems both make use of high internal pressure loss to reduce water consumption. So in effect, equipping households with these devices utilizes the principle of pressure reduction, applying it to the discharge end of the pipe rather than to the intake without compromising storage and fire-fighting capabilities. Therefore, EBMUD's water conservation program emphasizes pressure reduction devices at the point of use rather than overall system pressure reduction.

Reclamation Projects

Table V-4

PROJECT	DESCRIPTION	STATUS	ANNUAL WATER SAVINGS (MGD)
EBMUD Filter Plants	Reclaimed backwash water from District filter plants	Standard Practice	2% of total treated water
Richmond Golf Course	Reclaimed wastewater from West Contra Costa Sanitary District for irrigation of the Richmond Golf and Country Club	Service Started 1984	0.25
EBMUD Special District 1	Reclaimed wastewater for landscape irrigation and general washdown at the facility	Standard Practice	0.54
Galbraith Golf Course	Reclaimed wastewater from the San Leandro Treatment Plant for irrigation of the Galbraith Golf Course in Oakland	Planning	0.24
Dublin San Ramon Services District	Reclaimed wastewater from Dublin San Ramon Services District for irrigation of golf courses, parks, playgrounds, and school grounds in the San Ramon Valley	Planning Study	1.4
Chevron U.S.A. Oil Refinery Cooling	Reclaimed wastewater from West Contra Costa Sanitary District or the Richmond Municipal Sewer District for reuse in Chevron's recirculating cooling tower	Preliminary Investigation	4.0

WATER AND WASTEWATER RECLAMATION

EBMUD recognizes that filter backwash water from its treatment plants and wastewater effluent from area treatment plants which are currently discharged to San Francisco Bay are a potential resource. Reclamation and reuse of this wastewater would help to conserve the natural water resources of EBMUD and the State. EBMUD has periodically investigated the feasibility of using reclaimed water to help meet the demands of its water customers. Table V-4 summarizes EBMUD's current efforts in reclamation projects.

Facilities for the reclamation and reuse of filter plant washwater were constructed at EBMUD's water treatment plants following the 1976-77 drought. Water reclaimed at these facilities is recycled through the normal treatment process. It is estimated that 2 percent of the total volume of water processed at the filter plants is reclaimed.

In 1979, EBMUD completed an extensive study of wastewater reclamation and reuse resulting in a three-part analysis that includes a Project Report, a Revenue Program, and an EIR. EBMUD worked closely with municipal and industrial entities to identify the most favorable projects that would involve the sale of reclaimed wastewater. The marketing survey identified large industrial and agricultural water users as the most cost effective for reclamation projects in the service area. One project, identified in the study, has been implemented and several others are being studied further.

EBMUD's Special District 1 wastewater treatment plant currently reclaims approximately 0.54 MGD of wastewater. The reclaimed water is used at the treatment plant for irrigation and general washdown.

In 1984, reclaimed wastewater from the West Contra Costa Sanitary District began being used for landscape irrigation of the Richmond Golf and Country Club. One hundred fifty acres are irrigated resulting in an estimated average annual consumption of 0.25 MGD. Peak monthly use during the irrigation season has reached 0.61 MGD.

The Galbraith Golf Course landscape irrigation project would reclaim an estimated average

annual flow of 0.24 MGD from the San Leandro Wastewater Treatment Plant. The peak day demand is estimated to be 0.72 MGD.

In August, 1983, EBMUD, the Dublin San Ramon Services District and Alameda County, jointly sponsored a study to investigate the potential for wastewater reclamation in a portion of the San Ramon Valley. The recommended project would provide irrigation for approximately 488 acres with an annual average demand of 1.4 MGD of water; plus augmentation of stream flows in the San Ramon and Walnut Creeks. An additional 362 acres may be irrigated in the future, increasing the potable water savings to 2.5 MGD.

The biggest potential savings of potable water is through a reclamation project at Chevron U.S.A.'s Richmond oil refinery. Reclaimed wastewater from West Contra Costa Sanitary District or possibly the Richmond Municipal Sewer District could replace up to 4 MGD of potable water used in the recirculating cooling towers. This project was originally identified in EBMUD's 1979 Wastewater Reclamation Project Report. The proposed project was not implemented because it could not be economically justified. Renewed interest by Chevron and EBMUD has prompted the consideration of alternatives that could lead to a viable, cost-effective reclamation project.

Chapter VI
Expanded Water Conservation Program

This chapter describes and evaluates additional water conservation measures, as elements of an expanded water conservation program, which EBMUD and its customers could undertake to further increase water savings.

PROGRAM DEVELOPMENT

The process employed in developing the expanded program was:

- Identify opportunities for water conservation.
- List *measures* that are technically feasible for the District to implement and their unit (per person) water savings, costs, and benefits.
- Group these measures, as appropriate, together with an implementation plan for each into alternative measures for evaluation.
- Perform a benefit/cost analysis of the alternatives.
- Evaluate other factors (social, environmental, etc.) relative to those alternatives.
- Select the most feasible alternative measures that would create effective water conservation *program elements*.
- Modify the selected program elements as appropriate so that they fit together as a comprehensive water conservation program.
- Define the elements of the program so that budget schedules and responsibilities for implementation can be identified.

Objectives and Goals

The objectives of EBMUD's water conservation program are to:

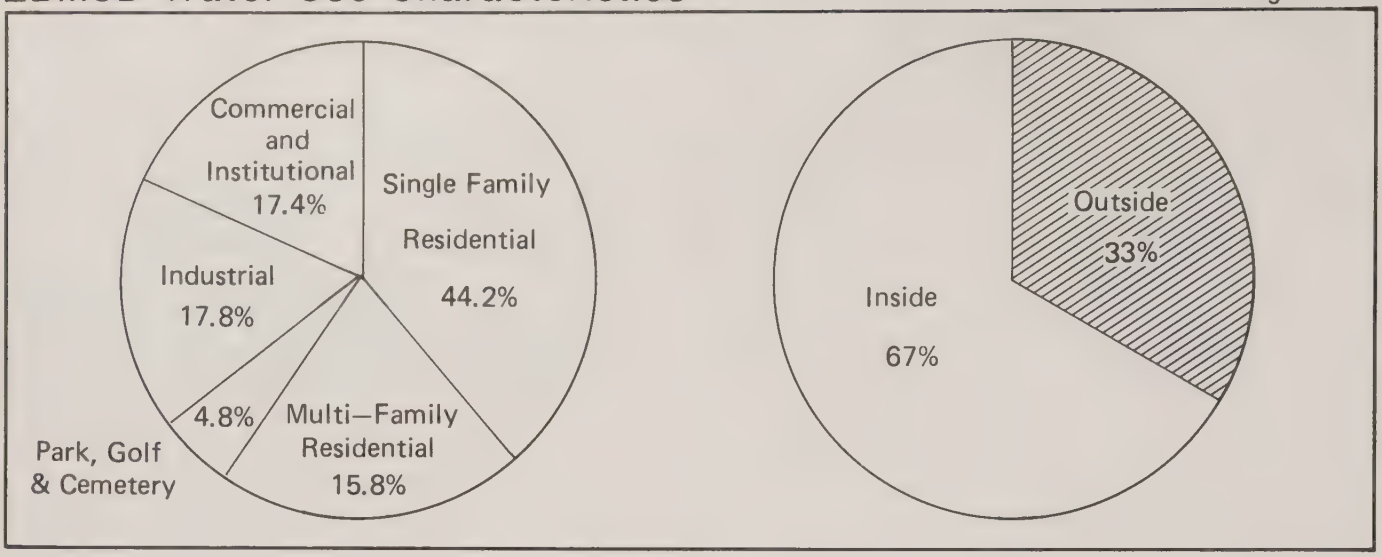
- Reduce costs of operation; and
- Reduce cost and environmental impacts of new supplies.

The goals of EBMUD's water conservation program to meet those objectives are:

- Increase public awareness of methods to save water, thereby encouraging customers to undertake water conservation measures on their own;
- Reduce water use by existing customers by encouraging landscape improvements and retrofitting existing dwellings and business establishments;
- Reduce water use by new customers by encouraging new dwellings and businesses to be as water efficient as possible in landscaping and inside use; and

EBMUD Water Use Characteristics

Figure VI-1



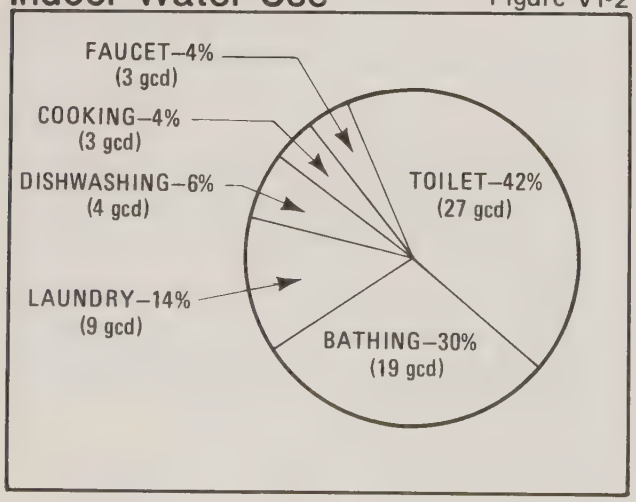
- Reduce peak demand, focusing on summer landscape irrigation.

Opportunities to Reduce Water Demand

Figure VI-1 shows a breakdown of water use into categories. Single family water use predominates in the District followed roughly equally by industrial, multi-family, and commercial and institutional. Figure VI-2 categorizes multi-family and single family indoor water use which averages about 65 gallons per capita per day (gcd). Note the large amount of water used to flush toilets and for bathing. Figure VI-3 compares the percentage of indoor and outdoor residential water use. Approximately 90 percent of outdoor residential water use is used for landscape irrigation. Clearly a water conservation program for both existing and future customers should focus on the residential sector (single and multi-family), with a lesser but significant emphasis on the commercial and industrial sector.

Single and Multi–Family Residential Indoor Water Use

Figure VI-2



POTENTIAL WATER CONSERVATION MEASURES

Reduction of Residential Water Use

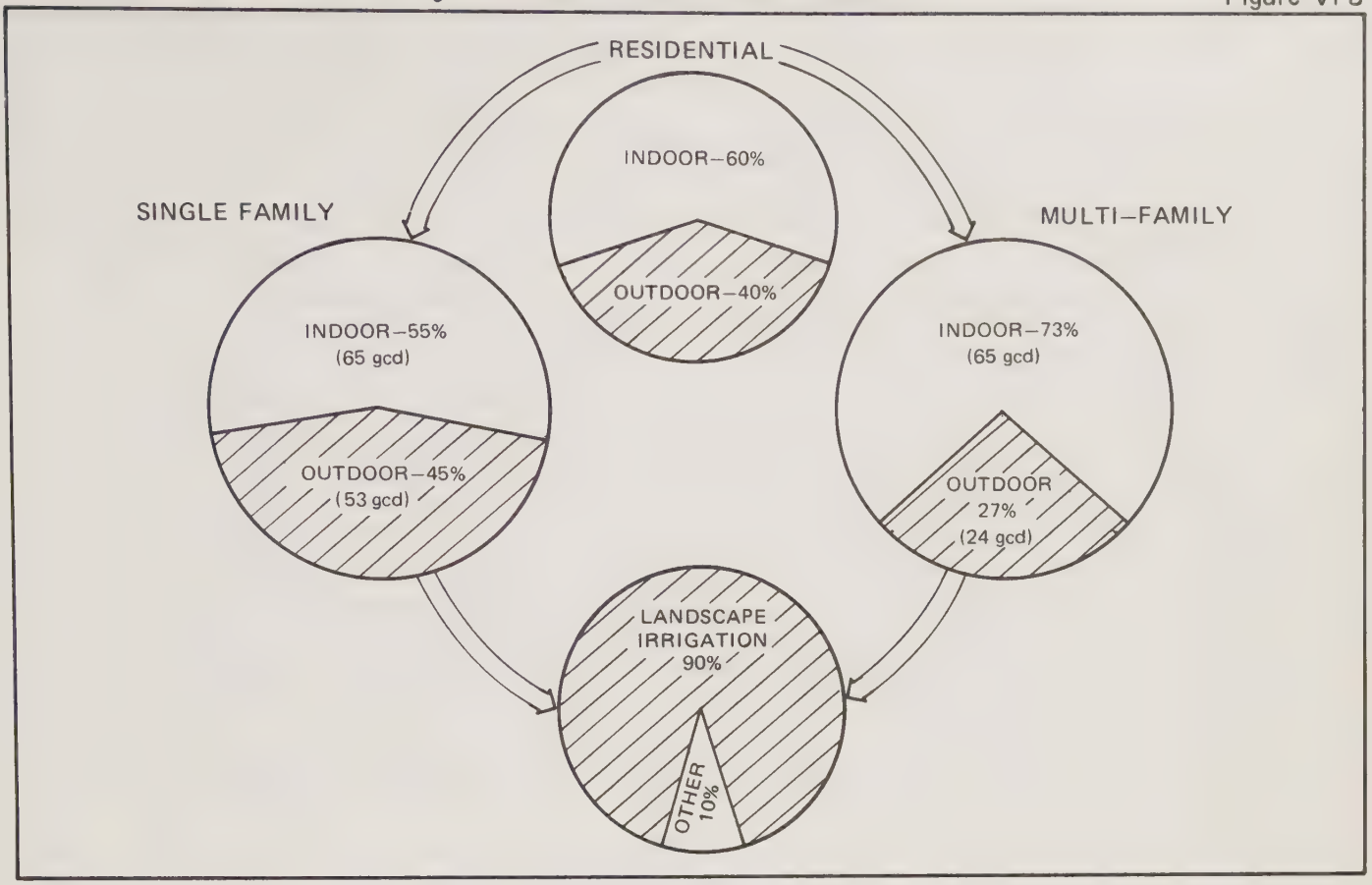
Table VI-1 lists the residential water conservation opportunities and the related measures to reduce demand that are considered as a basis for an expanded water conservation program.

Figure VI-4 shows the potential measures that are technically feasible and which were developed for evaluation. Water savings are given in gallons per capita per day (gcd) and energy savings in therms per year. The estimated average installation cost per dwelling unit is also shown.

An important factor to consider in evaluating the value of reducing inside water use is the as-

Single and Multi-Family Residential Water Use

Figure VI-3



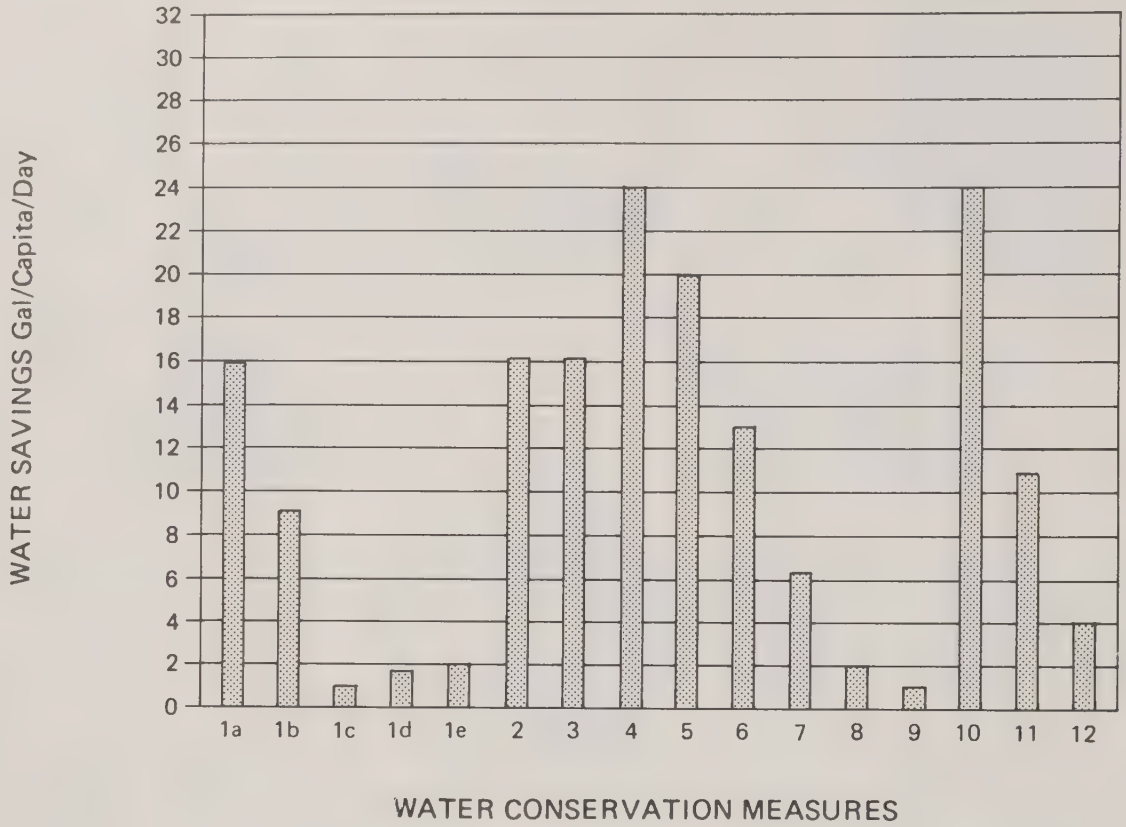
Measures Considered -- Residential Customers

Table VI-1

WATER CONSERVATION OPPORTUNITIES	EXISTING RESIDENTIAL CUSTOMERS MEASURES TO REDUCE WATER USE	NEW RESIDENTIAL CUSTOMERS MEASURES TO REDUCE WATER USE
Reduce Inside Water Use	• Retrofit showers and toilets • Install low-water-use appliances • Improve water use practices	• Meet existing code for showers and toilets • Install advanced fixtures -- ultra-low flow showers and toilets • Establish efficient water use practices
Reduce Outside Water Use	• Install efficient irrigation systems • Replace landscaping with low-water-use plants • Improve water use practices	• Install efficient irrigation systems • Install low-water-use-landscaping • Establish efficient water use practices

Water Conservation Measures – Residential

Figure VI-4



	POTENTIAL MEASURE	SAVINGS TO CUSTOMERS		ADDITIONAL INSTALLATION COST PER DWELLING UNIT ($)
		WATER SAVINGS (Gal/Capita/Day)	ENERGY SAVINGS (T/Cap/Y)	
1a	1.5 Gal/Flush Toilet	16.0	0.0	100
1b	2.0 GPM Showerhead	9.1	15.0	0
1c	Low Water Dishwasher	1.0	2.9	40
1d	Low Water Clothes Washer	1.7	2.7	50
1e	Insulate Hot Water Pipes	2.0	5.8	200
2	Retrofit Devices	16.2	12.0	0
3	Retrofit on Resale	16.2	12.0	20
4	Water Audit, SF	24.0	12.0	0
5	Water Audit, MF	20.0	12.0	0
6	Efficient Sprinklers, SF	13.0	0.0	1,500
7	Efficient Sprinklers, MF	6.3	0.0	500
8	Drip Irrigation, SF	2.0	0.0	200
9	Drip Irrigation, MF	1.0	0.0	100
10	Low Water Landscapes, SF	24.0	0.0	2,600
11	Low Water Landscapes, MF	11.0	0.0	900
12	Public Education	4.0	0.0	0

sociated energy savings. Overall, heating hot water amounts to 15 percent of total energy use in a residential dwelling unit, ranking only behind space heating at 54 percent. This fact can contribute to water conservation, since water conservation will result in reduced energy bills.

The water savings and costs used for the inside measures are based upon results of studies conducted by Brown and Caldwell for the U.S. Department of Housing and Urban Development. Those studies are summarized in a 1984 report entitled *Residential Water Conservation Projects — Summary Report*.

The water savings and costs used for outside measures are based upon results from the first year of monitoring EBMUD's water-conserving residential demonstration gardens.

Water savings from the public information program is based upon literature research, and ranges from 0 to 5 percent. A figure of 2 percent water savings was used in this report.

Measures Considered

- Advanced Fixtures — Fixtures and appliances which can be replaced or modified (retrofitted) to save water include:
  - Toilets
  - Showerheads
  - Clothes washers and dishwashers
  - Insulation of hot water pipes

The above items correspond to measures 1a through 1e in Figure VI-4. They represent more-advanced plumbing fixtures, including ultra low water use toilets (1.5 gallons per flush) and showerheads (2.0 gpm), compared to current code requirements for low water use (3.5 gallons per flush and 2.75 gpm, respectively). They also represent more advanced clothes washers and dishwashers which are designed to save some additional water, but which are primarily energy savers. Some of these items may be more expensive but save more water and energy and merit evaluation. As these ultra-low use fixtures and appliances come into more common use, their prices are expected to be more comparable to conventional fixtures and appliances.

- Retrofit Devices — Retrofit devices would include low-flow showerheads, a 1/2 gallon water bag for the water closets, and dye tablets for toilet tank leak detection.
- Retrofit On Resale — This measure would be based upon the seller installing the above retrofit devices prior to the close of escrow.
- Water Audits — Single-Family (SF) — This measure would involve inspection of single-family dwelling units to recommend improvements in water use efficiency, including installation of retrofit devices, fixing toilet and faucet leaks, and improvements to landscape irrigation practices.
- Water Audits — Multi-Family (MF) — This measure would involve inspection of multi-family dwelling units to recommend improvements in water use efficiency, includ ing installing retrofit devices and fixing toilet and faucet leaks. Improvements to landscape irrigation practices could also be included.
- Efficient Sprinkler System — Single Family (SF) — This measure would include installing an automatic irrigation control system, low volume sprinkler heads, and a moisture sensing device installed for existing landscaping.
- Efficient Sprinkler System — Multi-Family (MF) — This measure would include all the above equipment; however, the per capita water savings is less due to the smaller landscaped area per capita in multi-family dwelling units.
- Drip Irrigation — Single Family (SF) — This measure would involve installing drip irrigation systems (drip, mist, soaker, or bubbler) for existing trees and shrubs.
- Drip Irrigation — Multi-Family (MF) — Same as above measure but would apply to multi-family dwelling units.
- Low Water Use Landscapes — Single Family (SF) — This measure would include the installation of water conserving plant material plus the installation of efficient irrigation systems. This measure saves more water than any other measure but is expensive unless the customer was already planning to landscape or relandscape.
- Low Water Use Landscapes — Multi-Family (MF) — Same as above measure but would apply to multi-family units.

- Public Education — This measure includes school education and public information activities designed to promote efficient water use. Water savings are conservatively estimated so as not to double count any of the other measures the customer might choose to undertake.

Reduction of Non-Residential Water Use

Non-residential categories of water use total 40 percent of the metered water use in the service area. They need a more specialized, individualized approach concentrating on the large water users.

Table VI-2 lists the non-residential water conservation opportunities and the related measures to reduce demand that are considered as a basis for an expanded water conservation program.

Commercial and Institutional (including public agencies): Water used by commercial establishments and public agencies is principally for sanitation purposes and irrigation of landscaping. Many of the water saving techniques described above for residential users are therefore directly applicable. Significant reductions may be achieved by modifying the present operating procedures of many of the larger water users, including recycling water. Commercial establishments and public agencies, being relatively large water users, have large incentives to develop water-efficient practices.

Measures that could provide long-term reductions in commercial and institutional water use include the following:

- Installation of retrofit water-saving devices and replacement valves on toilets.
- Periodic adjustment of flush valves on toilets and urinals.
- Installation of more efficient water-using appliances.
- Installation of low-flow showerheads at gyms, pools, and schools.
- Performance of routine plumbing and fixture inspections to eliminate leaks.
- Installation of more water-efficient clothes washers in laundromats.
- Recycling of car-wash water.
- Use of automatic irrigation systems, drip irrigation and low water use landscaping.

Providing individualized technical assistance and incentives to large commercial users to reduce water use is often very cost-effective when compared to other measures such as public education and residential retrofit. During 1981 to 1983 the City of San Jose successfully completed such a program which was sponsored by the San Jose Chamber of Commerce.

Industrial: Water use per account is highest in the industrial sector due to the large amounts of water used in industrial processes. Measures available to reduce industrial water use include those measures applicable to the commercial and institutional customers discussed above plus:

- Reusing or reclaiming water or wastewater; and
- Changing production methods.

By classifying and segregating water and wastewater flows potential reuse and reclamation projects can be identified. Conservation begins when an industry changes from an "open" to a "closed" system. By reusing water where possible both water costs and waste treatment costs are lower. In many cases, the current water pricing and wastewater rates do not justify the additional capital expenditure necessary for a closed system. A rebate program could be considered to encourage reclamation.

Sometimes it is possible to change from a "wet" process to a "dry" process or to alter processes to reduce volume. An example of this would be to use "dry" cleaning of equipment and grounds instead of washing with water.

The number of measures available to reduce water use and the degree of process changes that are economically feasible will vary from industry to industry.

Parks, Golf Courses, and Cemeteries: Nearly all water used in this category is for irrigation purposes. The same efficient irrigation measures discussed under the residential section apply here except that the potential for water savings per account is greater due to the large areas that are irrigated.

Measures Considered -- Non-Residential Customers

Table VI-2

WATER CONSERVATION OPPORTUNITIES	EXISTING NON-RESIDENTIAL CUSTOMERS MEASURES TO REDUCE WATER USE	NEW NON-RESIDENTIAL CUSTOMERS MEASURES TO REDUCE WATER USE
Reduce Inside Water Use	• Retrofit showers and toilets • Maintenance and periodic adjustment of fixtures • Improve water use practices	• Meet existing code for showers and toilets • Install advanced fixtures -- ultra-low flow showers and toilets • Establish efficient water use practices
Reduce Commercial and Industrial Process Water Use	• Install low-water-use equipment • Improve processes and method of production • Reclaim and reuse water and wastewater	• Install low-water-use equipment • Design efficient processes and production methods • Reclaim and reuse water and wastewater
Reduce Outside Water Use	• Install efficient irrigation systems • Replace landscaping with low-water-use plants • Improve water use practices	• Install efficient irrigation systems • Install low-water-use landscaping • establish efficient water use practices

EVALUATION OF ALTERNATIVE MEASURES

The evaluation involves identifying water and energy savings, to both EBMUD and its customers, associated with implementing individual measures or groups of measures and then quantifying the benefits and costs. Finally, other non-economic factors were used to complete the screening process.

Evaluation of Residential Alternative Measures

Figure VI-5 shows the potential residential market for water conservation broken down into existing and new dwelling units by single family and multi-family. Figure VI-6 shows the alternative water conservation measures and the estimated customer response (market penetration) over the next 20 years if these measures were implemented District-wide.

The projected water savings associated with the assumed market penetration level are shown on Figure VI-6. The target population is determined by multiplying the number of dwelling units in the potential market (Figure VI-5) by the estimated percentage market penetration and by an averge household size of 2.50 people in single family dwellings and 1.80 people in multi-family dwellings in the year 2005.

The water savings are determined by multiplying the target population for each alternative by the projected per capita water savings associated with the measures involved (Figure VI-4). For example the water savings associated with the advanced fixtures was determined by adding per capita savings for measures 1a through 1e and multiplying that total by the number of people expected to occupy 50 percent of the new homes planned to be built between 1985 and 2005.

EBMUD benefits were calculated using the savings in operating costs from Table VI-3. EBMUD costs include labor and materials to carry out the alternative.

Residential Benefits and Costs: The benefits of the water conservation alternatives are shown on Table VI-4. No customer benefits were assigned for water savings because approximately 95 percent of District costs are fixed and 5 percent are variable (water use related). Thus, one effect of a water conservation program would be to slightly increase the per unit cost of water. Customers who conserve (use less water) would have a lower water bill, with savings in rough proportion to their reduced use, and those who do not would have a higher water bill because of the higher unit cost. The average customer's water bill would change very little.

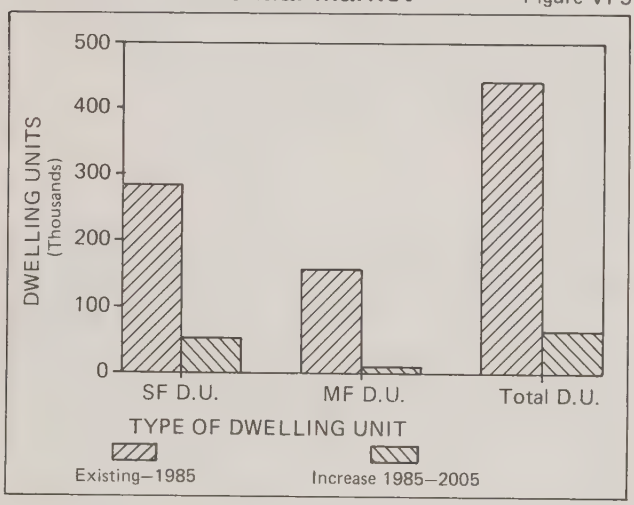
It should be noted, however, that if the benefits of the proposed program exceed the costs, then the overall effect would be to reduce overall District operating costs and thus lower the *total* community cost for water. The only benefits credited to the customer are for reduced energy use for water heating.

Table VI-5 shows the costs of the alternatives to the customer and EBMUD. Customer costs are quite large for installing advanced plumbing fixtures (ultra-low flow) and water conserving landscapes due to the cost of replacing existing devices and systems.

Figure VI-7 shows the combined residential costs and benefits associated with the alternatives and the benefit to cost ratio of the alternatives for residential customers and the District. The last column of Figure VI-7 is the combined benefit to cost ratio to the community associated with each alternative. A benefit to cost ratio of more than one indicates a measure that is cost-effective.

The most cost-effective measures are prime candidates for the expanded water conservation program. However, the selection requires analysis with respect to other factors, discussed later in this chapter. Some alternatives with low benefit-cost ratios may also be included to provide a balanced program, which as a whole will be cost-effective.

Potential Residential Market Figure VI-5



EBMUD Operational Cost Savings

Table VI-3

DESCRIPTION	COST ($/MGD)	SAVINGS ($/1000 gal.)
Pumping Cost	$109,000	.30
Water Treatment Cost	4,000	.01
Wastewater Treatment Cost*	7,500	.02
Reduced Capital Cost	34,000	.09
Additional Power Generated	18,000	.05

*Assumes 30% of the water supplied to customers is treated at the District wastewater treatment facilities.

Evaluation of Non-Residential Alternative Measures

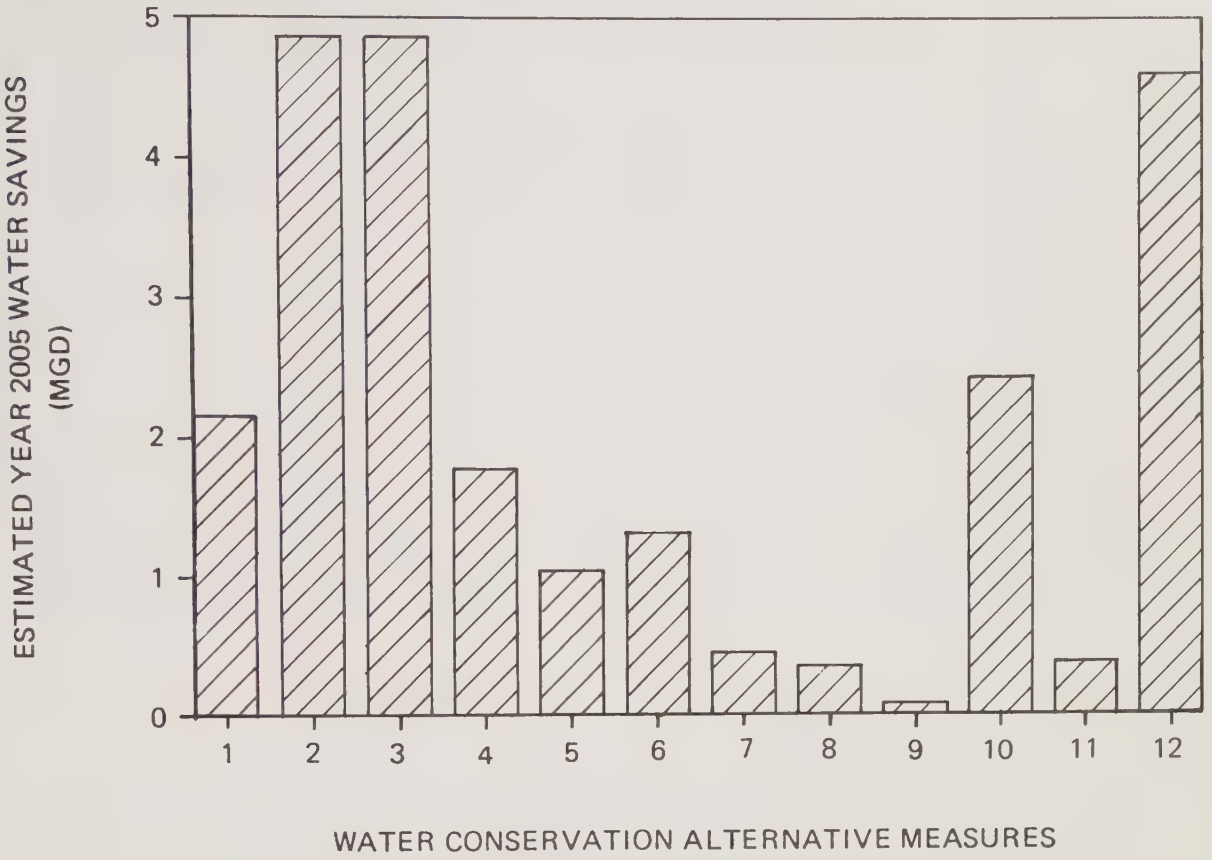
Non-residential water consumption accounts for approximately 40 percent of all metered water demand yet involves only 8.4 percent of all accounts. Current levels of non-residential water use for years of normal weather are shown in Table VI-6. Approximately 77 percent of non-residential water use was used indoors and 23 percent was used outdoors.

Table VI-7 shows the projected water savings from non-residential customers. The estimated response column in this table represents the expected market penetration associated with each alternative. Unlike the projected residential savings, the projected water savings for non-residential customers were made on a percentage basis instead of on a per capita basis. This is due to the wide variety of water use processes associated with non-residential water users.

Non-Residential Benefits and Costs: Benefits and costs were analyzed in a similar fashion to the residential analysis. Results are shown in Table VI-8. Customer benefits for water saved were assumed to be zero, as an average, even though cus-

Projected Residential Water Savings (By 2005)

Figure VI-6



ALTERNATIVE MEASURES CONSIDERED	MARKET PENETRATION		AFFECTED POPULATION*	EST. YEAR 2005 WATER SAVINGS (MGD)
	EXISTING HOUSING	NEW HOUSING		
1. Advanced Fixtures	0%	50%	73,000	2.16
2. Retrofit Devices	30	0	300,000	4.86
3. Retrofit on Resale	30	0	300,000	4.86
4. Water Audits SF	10	0	74,000	1.77
5. Water Audits, MF	20	0	52,000	1.04
6. Efficient Sprinklers SF	10	25	101,000	1.31
7. Efficient Sprinklers MF	20	50	71,000	0.45
8. Drip Irrigation SF	20	25	175,000	0.35
9. Drip Irrigation MF	20	50	71,000	0.07
10. Low Water Landscapes SF	10	25	101,000	2.42
11. Low Water Landscapes MF	10	25	36,000	0.38
12. Public Education	100	100	1,149,000	4.60

*BASED ON AN EXISTING POPULATION OF 1,086,000 DECLINING TO 1,003,000 IN 2005 PLUS 146,000 PEOPLE IN NEW HOUSING.

Projected Residential Benefits (By 2005)

Table VI-4

ALTERNATIVE MEASURES CONSIDERED	ANNUAL SAVINGS, ($1,000s)						
	District Treatment and Capital Savings	ENERGY			TOTAL		TOTAL COMBINED
		District Pumping Savings	District Increased Power Gen.	Customer Heating Savings	CUSTOMER	DISTRICT	
1. Advanced Fixtures	97	234	40	1,544	1,544	371	1,915
2. Retrofit Devices	220	529	87	2,913	2,913	836	3,749
3. Retrofit on Resale	220	529	87	2,913	2,913	836	3,749
4. Water Audits, SF	80	192	31	715	715	303	1,018
5. Water Audits, MF	46	113	19	505	505	178	683
6. Efficient Sprinklers, SF	59	142	24	0	0	225	225
7. Efficient Sprinklers, MF	19	49	8	0	0	76	76
8. Drip Irrigation, SF	15	38	6	0	0	59	59
9. Drip Irrigation, MF	3	8	1	0	0	12	12
10. Low Water Landscapes SF	109	264	43	0	0	416	416
11. Low Water Landscapes MF	17	42	7	0	0	66	66
12. Public Education	207	500	82	0	0	789	789

NOTE:

District savings based on costs in Table VI - 6, customer heating for hot water assumes cost of $0.81/therm.

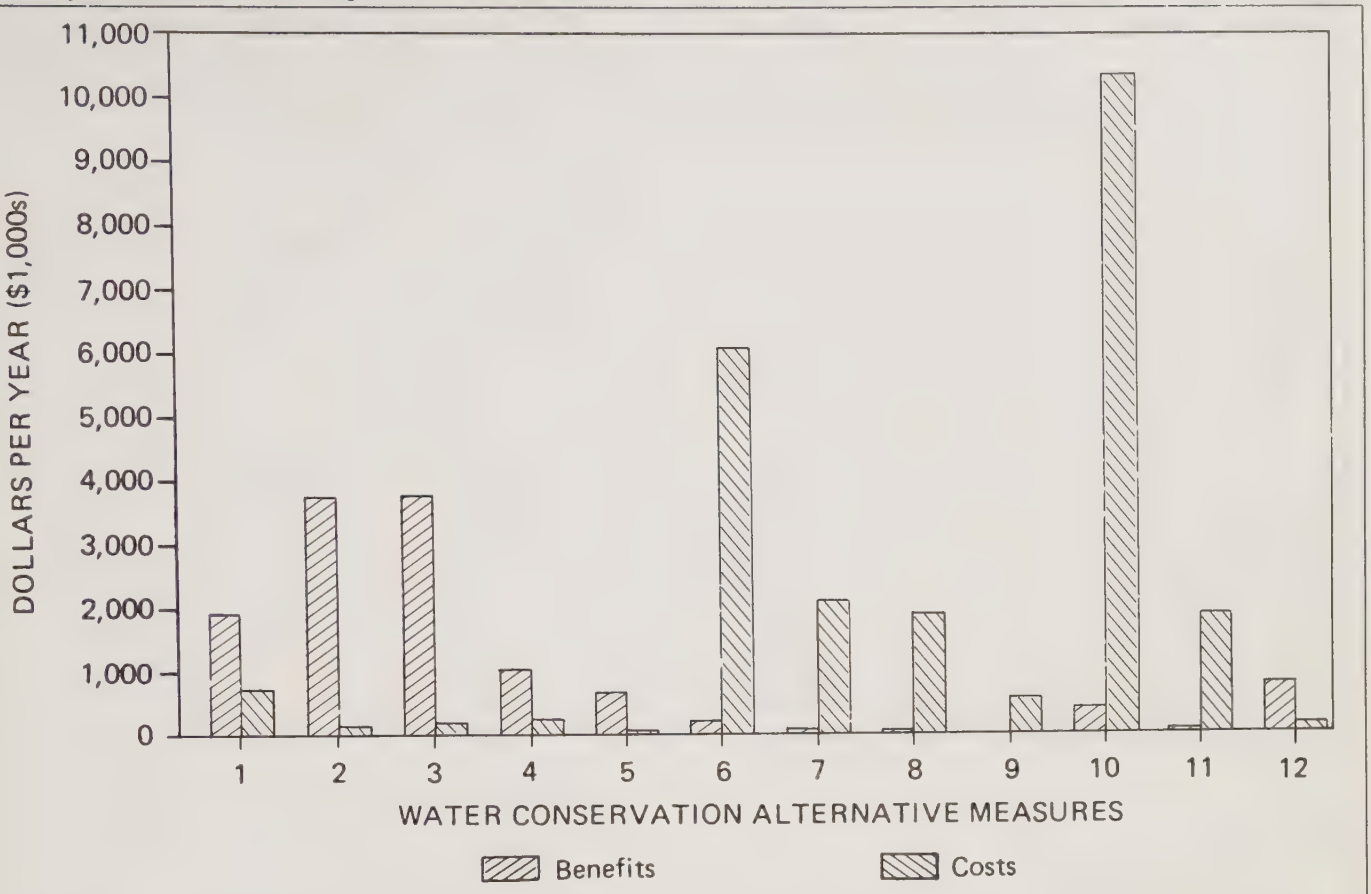
Projected Residential Costs (By 2005)

Table VI-5

ALTERNATIVE MEASURES CONSIDERED	LIFE (YEARS)	TOTAL INITIAL CUSTOMER COSTS ($1,000's)	ANNUAL COSTS (1,000's)		
			CUSTOMER	DISTRICT	COMBINED
1. Advanced Fixtures	20	81,200	627	100	727
2. Retrofit Devices	—	0	0	150	150
3. Retrofit on Resale	20	0	120	50	170
4. Water Audits SF	—	0	0	250	250
5. Water Audits MF	—	0	0	50	50
6. Efficient Sprinklers SF	20	55,980	5,730	400	6,103
7. Efficient Sprinklers MF	20	18,800	1,913	200	2,113
8. Drip Irrigation SF	20	12,700	1,898	25	1,923
9. Drip Irrigation MF	20	3,700	550	25	575
10. Low Water Landscapes SF	20	74,000	9,971	400	10,371
11. Low Water Landscapes MF	20	12,100	1,706	200	1,906
12. Public Education	—	0	0	150	150

Comparison of Projected Residential Benefits and Costs

Figure VI-7



ALTERNATIVE MEASURES CONSIDERED	CUSTOMER			DISTRICT			COMBINED		
	ANNUAL BENEFITS ($1,000s)	ANNUAL COSTS ($1,000s)	B/C RATIO	ANNUAL BENEFITS ($1,000s)	ANNUAL COSTS ($1,000s)	B/C RATIO	ANNUAL BENEFITS ($1,000s)	ANNUAL COSTS ($1,000s)	B/C RATIO
1 Advanced Fixtures	1,544	627	2.5	371	100	3.7	1,915	727	2.6
2 Retrofit Devices	2,913	0	—	836	150	3.6	3,749	150	25.0
3 Retrofit on Resale	2,913	120	24.3	836	50	16.7	3,749	170	22.0
4 Water Audits, SF	715	0	—	303	250	1.2	1,018	250	4.1
5 Water Audits, MF	505	0	—	178	50	3.6	683	50	13.7
6 Effieient Sprinklers, SF	0	5,703	0	225	400	0.6	225	6,103	0.04
7 Efficient Sprinklers, MF	0	1,913	0	76	200	0.4	76	2,113	0.04
8 Drip Irrigation, SF	0	1,898	0	59	25	2.5	59	1,963	0.03
9 Drip Irrigation, MF	0	550	0	12	25	0.5	12	575	0.02
10 Low Water Landscape, SF	0	9,971	0	416	400	1.0	416	10,371	0.04
11 Low Water Landscape, MF	0	1,706	0	66	200	0.3	66	1,906	0.03
12 Public Education	0	0	0	789	150	5.3	789	150	5.3

Non-Residential Metered Water Use*

Table VI-6

CATEGORY	NUMBER OF ACCOUNTS	WATER USE (MGD)	INSIDE (MGD)	OUTSIDE (MGD)
Commercial and Institutional	21,832	29	23	6
Industrial	2,155	33	31	2
Park, Golf and Cemetery	3,409	11	1	10
TOTAL	27,396	73	55	18

*Existing customers, estimated for normal year

tomers who save water will have a lower water bill. Benefits are attributed to energy saved as a result of device distribution and water audits, and from water and wastewater pretreatment savings resulting from water audits. Customer costs were assumed to be zero except for changes suggested to the customer by the water audits (assumed to be $100,000 per year District-wide).

Other Factors

Other factors that can have an impact on the community as a result of demand management programs besides monetary impacts are:

- Environmental/Technical
- Social/Political
- Customer Impact

Table VI-9 shows an evaluation of these other factors. The method used is an adaptation of a method contained in a recent American Water Works Association publication entitled *Before the Well Runs Dry, Volume I — A Handbook for Designing a Local Water Conservation Plan.* Impacts are listed on the left and generic alternatives are listed across the top. A '+' was assigned for a positive impact, a '−' for a negative impact and no entry means no impact.

From Table VI-9 it is clear that technical/environmental impacts are all favorable where applicable and that mandatory alternatives, such as retrofit on resale, has large negative social/political and customer impacts.

Assembling the Elements of the Program

Based upon the evaluation of the alternatives, a water conservation program is proposed to include the following categories of elements:

- Retrofit device distribution
- Water audits
- Water efficient landscapes, including irrigation systems
- Improved efficiency in new development
- Public education
- District activities

These categories include the referenced residential measures and program elements given in Table VI-10.

With the exception of landscape incentives, all of the above elements were found to have a benefit-cost ratio greater than one. A retrofit device distribution program was selected over the retrofit on resale program to avoid the negative aspects of a mandatory program element.

Water audits for all customers are cost-effective, however, since the benefit-cost ratio for single family is the lowest, it would be given lowest priority in the program.

Water efficient landscapes for single-family and multi-family offer attractive water savings but are not cost-effective unless the homeowner was planning to landscape or re-landscape. In this case, customer costs would be zero since low water use plants cost no more than new more-traditional landscaping. However, EBMUD would still need to actively promote this concept to increase penetration over present low levels. A requirement for water efficient landscapes in new developments, except single-family, was selected as one of the forms of encouragement needed.

Regulations governing landscapes, including types of plants, area of turf, and efficient irrigation systems, would provide the most-significant water savings. The application of such regulations to commercial, institutional, industrial, multi-family, and planned unit developments is practical because landscaping and irrigation systems are generally subject to the plan review process in cities and counties. Also, the smaller number of such developments would make enforcement more feasible. However, single family developments are generally not subject to plan review by cities and

Projected Water Savings from Non-Residential Customers

Table VI-7

	CATEGORICAL USERS	2005 Proj. Water Demand MGD	WATER AUDITS Est. Response Over 20 yrs.	WATER AUDITS Est. Average Savings	WATER AUDITS Est. Savings MGD	DEVICE DISTRIBUTION Est. Response Over 20 yrs.	DEVICE DISTRIBUTION Est. Average Savings	DEVICE DISTRIBUTION Est. Savings MGD	INCENTIVE-SCC DISCOUNT Est. Response Over 20 yrs.	INCENTIVE-SCC DISCOUNT Est. Average Savings	INCENTIVE-SCC DISCOUNT Est. Savings MGD	LANDSCAPE REGULATION Est. Response Over 20 yrs.	LANDSCAPE REGULATION Est. Average Savings	LANDSCAPE REGULATION Est. Savings MGD	Total Savings MGD
EXISTING CUSTOMERS	Inside Use														
	Commercial & Institutional	23	33%	20%	1.5	30%	1%	0.1	—	—	—	—	—	—	
	Industrial	31	33%	10%	1.0	—	—	—	—	—	—	—	—	—	
	Park, Golf, & Cemetery	1	—	—	—	—	—	—	—	—	—	—	—	—	
	Outside Use														
	Commercial & Institutional	6	20%	20%	0.3	—	—	—	—	—	—	—	—	—	
	Industrial	2	20%	20%	0.1	—	—	—	—	—	—	—	—	—	
	Park, Golf & Cemetery	10	20%	20%	0.4	—	—	—	—	—	—	—	—	—	
	TOTAL	73			3.3			0.1			0.0			0.0	3.4
NEW CUSTOMERS	Inside Use														
	Commercial & Institutional	5	—	—	—	—	—	—	50%	10%	0.3	100%	5%	0.3	
	Industrial	3	—	—	—	—	—	—	50%	5%	0.1	100%	5%	0.2	
	Park, Golf & Cemetery	0	—	—	—	—	—	—	—	—	—	—	—	—	
	Outside Use														
	Commercial & Institutional	1	—	—	—	—	—	—	—	—	—	100%	40%	0.4	
	Industrial	0	—	—	—	—	—	—	—	—	—	100%	40%	—	
	Park, Golf & Cemetery	2	—	—	—	—	—	—	—	—	—	100%	20%	0.4	
	TOTAL	11			0.0			0.0			0.4			1.3	1.7
GRAND TOTAL		84			3.3			0.1			0.4			1.3	5.1

Projected Non-Residential Benefits and Costs ($1000s)

Table VI-8

ALTERNATIVE PROGRAM ELEMENT	WATER SAVINGS MGD	CUSTOMER ANNUAL BENEFITS	CUSTOMER ANNUAL COSTS	CUSTOMER B/C	DISTRICT ANNUAL BENEFITS	DISTRICT ANNUAL COSTS	DISTRICT B/C	COMBINED ANNUAL BENEFITS	COMBINED ANNUAL COSTS	COMBINED B/C
Water Audits	3.3	100	100	1.0	600	50	12.0	700	150	4.7
Device Distribution	0.1	59	0	–	17	5	3.4	76	5	15.2
Landscape Regulations	1.3	0	0	–	223	50	4.5	223	50	4.5
Incentive----- SCC Discount	0.4	293	0	–	51	25	2.0	344	25	13.8
TOTAL	5.1	452	100	4.5	891	130	6.9	1343	230	5.8

Evaluation of Other Factors

Table VI-9

IMPACTS	ADV. FIXTURES	RETRO. DEVICES	RETRO RESALE	WATER AUDIT	EFF. SPRINK	DRIP IRRIG.	LOW WATER PLANTS	PUBLIC EDUC.
TECHNICAL/ENVIRONMENTAL								
New source development Postponed or reduced	+	+	+	+	+	+	+	+
Reduced District operating costs	+	+	+	+	+	+	+	+
Reduced homeowner energy consumption	+	+	+	+				
Reduced District energy consumption	+	+	+	+	+	+	+	+
Reduced wastewater volume	+	+	+	+				
Increased life of water, Wastewater treatment facilities	+	+	+	+	+	+	+	+
Stream flows may increase	+	+	+	+	+	+	+	+
SOCIAL/POLITICAL								
Create new jobs locally	+	+	+	+	+	+	+	+
User and special interest group opposition to program			–					
User and political cooperation and understanding of utility operations	+		+					+
Cooperation of enforcement authority to implement program may be difficult	–		–					
Cooperation with school department and other community departments may be difficult	–		–					
Fairness of measure			–					
Requires landscaping attitude change							–	
CUSTOMER IMPACT								
Users who conserve will have lower water bills (some will have lower wastewater bills)	+	+	+	+	+	+	+	+
Users who do not conserve will have slightly higher water bills	–	–	–	–	–	–	–	–
Users who conserve will have lower energy bills	+	+	+	+				
Health and safety				+				
Significant customer expense if mandatory	–				–	–	–	

Cross Reference of Program Elements

Table VI-10

CATEGORIES OF ELEMENTS	REFERENCE TO RESIDENTIAL MEASURES (Figure VI-8)	REFERENCE TO PROGRAM ELEMENTS (Table VI-8)
Water Saving Device Distribution	2	A
Water Audits Residential	4, 5	B
Water Audits (Commercial & Institutional)	--	B
Landscape Incentives (Single Family)	10,11	C,D
SCC Discount	1	E
Landscape Regulations	--	F
Public Education	12	G,H
District Activities	--	

counties for landscaping and irrigation and the large number of new single family units each year would make enforcement difficult and expensive. For these reasons, incentives to encourage efficient landscaping and irrigation systems is a more reasonable approach.

Contra Costa County has developed a policy which requires low-water-use landscaping, limited area of turf, and low volume irrigation systems for all commercial, institutional, industrial, multi-family, and planned unit develop ments (PUD's) in the unincorporated areas of the County. That policy excludes single family developments other than PUD's. The county is currently encouraging cities to adopt the same policy.

A sound, expanded public education program completes the plan.

PROPOSED PROGRAM

This section presents a plan for improving water use efficiency through water conservation and defines the implementation requirements. The plan is a combination of the most cost-effective and socially and environmentally acceptable alternatives evaluated previously.

The proposed expanded water conservation program includes a plan (i.e., the physical methods to be used to reduce water use) as summarized in Table VI-11, and an explanation of how the various elements of the plan will be implemented. The plan and the means for implementation constitute the program. Costs have been estimated for customer purchase and installation of the devices which will reduce water use and for EBMUD's time and materials needed to implement the plan.

Table VI-12 shows the projected water savings from the proposed program elements. Figure VI-8 shows the projected benefits and costs of the proposed program. Benefits and costs are the same as given for the corresponding alternative except for the water efficient landscapes where the customer cost was set at zero. The overall program will have a benefit-cost ratio of 7 to 1 in the year 2005. For the entire 20 year period (1985-2005) the overall average benefit-cost ratio will be approximately 3.5 to 1.

The various elements of the proposed expanded water conservation program will require District expenditures. The source of funds would be considered at the time each of the elements is developed as a detailed proposal for approval. The source could be the general revenue of the District, including water rates, or could be the new water conservation and development fund which the District intends to establish.

Program Elements

WATER SAVING DEVICE DISTRIBUTION

Purpose — The purpose of distributing water saving devices is to increase the penetration (now estimated at 40 percent) of low-flow showerheads and water closet devices in single and multi-family residences, hotels and motels.

Approach — Water saving kits will be developed that will include a quality low flow showerhead and a ½ gallon water bag for the water closet. They will be offered to hotels, motels and multi-family residences through the water audit program and to single family residences through EBMUD business offices.

Records will be maintained by the EBMUD's water audit representative of distribution at hotels, motels and multi-family residences in order to estimate water savings. Personnel at EBMUD business offices will maintain records of single family homeowners who obtain the kits in order to estimate water savings.

Implementation — Manufacturers of four or five low-flow showerheads (less than 2.75 gpm) will be selected based upon the acceptability and quality of the shower. The District will purchase showerheads, which will be used to make up the kits along with water bags and dye tablets. The kits will then be distributed through the water audit program and through EBMUD business offices. Commercial businesses such as hotels and motels will be charged a nominal fee for each kit and single and multi-family residences will receive them free. Records will be maintained in order to perform follow-up surveys to estimate water savings and customer attitudes.

WATER AUDITS

Purpose — The purpose of water audits is to examine water use practices, detect leaks, and make recommendations for improved efficiency.

Approach — Water audits will be offered to all customers. Industrial, commercial, and institutional customers will be targeted for water audits due to their individual high water use. Multi-family audits will be given priority over single family audits because they are more cost-effective. The EBMUD representative will fill out a standardized form that includes recommendations, estimated water savings, and the cost-effectiveness of the recommended changes.

While the primary focus of the audit program will be inside and process water use, information will also be provided on improvement of outside water use efficiency.

Implementation — A full-time EBMUD representative will be needed to conduct the water audits. This individual will be required to have knowledge of industrial processes, recycling systems, cooling systems, and general knowledge of plumbing systems along with the ability to maintain records, prepare reports and make presentations before community groups. Technical information will be developed by EBMUD (similar to the PG&E energy audit program) to aid customers. Records of contacts will be maintained in order to monitor program effectiveness and to assist in the preparation of an annual evaluation of the program.

LANDSCAPE CONSULTATION

Purpose — The purpose of offering land scape consultation is to familiarize customers with low water using landscape concepts and associated benefits, and to provide technical assistance.

Approach — EBMUD will offer low water using landscape advice to customers planning either to install new landscapes or alter existing landscapes. The services of an EBMUD representative will be offered to customers who request detailed technical information on low water using landscape concepts.

EBMUD will also develop a 20 to 30 minute videotape with information on low-water using landscapes and how to install water conserving irrigation systems. This tape will be made available through EBMUD business offices and through local nurseries and video stores.

Implementation — An EBMUD landscape architect will perform the landscape consulting services and promote the use of low water using landscapes. Records will be maintained so that followup surveys can be made to evaluate program effectiveness, monitor water savings, and determine customer attitudes.

LANDSCAPE REBATE

Purpose — The purpose of offering a monetary rebate to all existing customers is to provide an incentive to install a water conserving landscape to those customers contemplating re-landscaping.

Approach — A cash rebate of up to $300 will be offered to existing single family homeowners who install a low water using landscape which

Recommendations For Expanded Water Conservation Program

Table VI-11

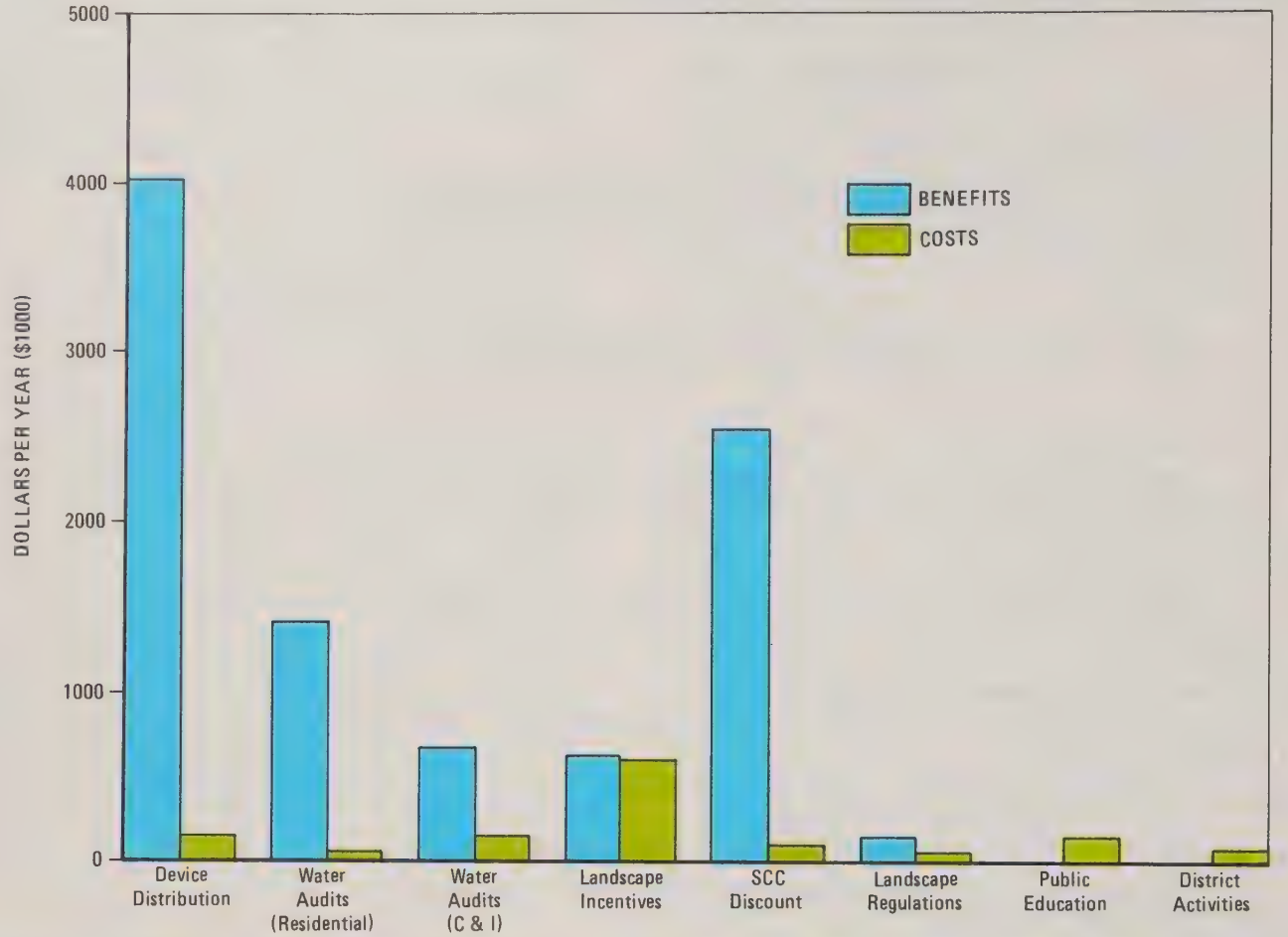
DEMAND MANAGEMENT ELEMENTS	START-UP TIME	FIRST YEAR COSTS*	ANNUAL COST AFTER FIRST YEAR*
A. WATER SAVING DEVICE DISTRIBUTION Offer 20,000 retrofit kits (first year) at EBMUD business offices and through water audits including low–flow showerheads and water bag for toilets to increase the number of water–saving devices installed in single and multi–family residences as well as commercial, institutional,** and industrial premises.	6 months	$ 150,000	$ 75,000
B. WATER AUDITS Offer to inspect water–use practices of existing industrial, commercial, institutional and single and multi–family residential customers and make recommendations for improved efficiency. Offer retrofit kits where applicable. Primary focus will be on indoor and process water use.	6 months	100,000	100,000
C. LANDSCAPE CONSULTATION Introduce all existing and new customers to low water–using landscape concepts and materials through mailings and personal contact. Customers will be offered technical assistance and District literature.	6 months	50,000	50,000
D. LANDSCAPE REBATE Offer a rebate to existing customers to provide an incentive to install water–conserving landscapes that meet District criteria (SF up to $300 and MF up to $5000, based on landscaped area).	1 year	550,000	550,000
E. SYSTEM CAPACITY CHARGE (SCC) DISCOUNT Offer discounts on the SCC paid by all new customers who exceed code requirements for shower heads and toilets.	1 year	100,000	100,000
F. LANDSCAPE WATER USE EFFICIENCY IN NEW DEVELOPMENTS Establish landscape water-use efficiency regulations for new residential, industrial, institutional, and commercial developments through cities and counties or by the District, if necessary; or Offer incentives to install water-conserving landscapes that meet District criteria through an SCC discount or rebate program.	3 months	50,000	50,000
G. PUBLIC INFORMATION Provide public information programs such as landscape booklets and brochures, exhibits, etc. to support and promote water conservation by demonstrating the methods for conserving water and the benefits of efficient water use.	6 months	125,000	50,000
H. SCHOOL EDUCATION Increase the promotion of wise water use habits and expand appreciation for water as a limited natural resource in primary and secondary schools.	3 months	25,000	10,000
I. SUPPORT ACTIVITIES Establish a Landscape Advisory Committee to provide technical support and act as liaison with the professional landscape community.	3 months	–	–
J. DISTRICT WATER USE ACTIVITIES Develop procedures to review District landscaping plans and retrofit existing District landscape to assure efficient water use.	on–going	25,000	10,000
K. WATER PRICING STUDY Study water conserving rate structures as a means of increasing water use efficiency.	1 year	15,000	0
L. PRESSURE REDUCTION STUDY Identify areas of high water pressure (greater than 80 psi) and investigate the feasibility of a pressure reduction program.	1 year	30,000	0
TOTAL COST		$1,220,000	$995,000

*Costs shown are District costs at FY 1986 level excluding departmental and administrative and general overhead

**Institutional customers include public agencies

Expanded Water Conservation Program Benefits and Costs

Figure VI-8



CATEGORIES OF ELEMENTS	ELEMENTS (TABLE VI-10)	WATER SAVINGS BY 2005 (MGD)	CUSTOMER			DISTRICT			COMBINED		
			ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO	ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO	ANNUAL BENEFITS ($1000)	ANNUAL COSTS ($1000)	B/C RATIO
Water Saving Device Distribution	A	5.3	3136	0	---	897	150	6.0	4033	150	26.9
Water Audits (Residential)	B	2.1	1035	0	---	365	50	7.3	1400	50	28.0
Water Audits (Comm. & Indust.)	B	3.3	100	100	1.0	566	50	11.3	666	150	4.4
Landscape Incentives	C, D	3.8	0	0	---	616	600	1.0	616	600	1.0
SCC Discount	E	2.8	2050	0	---	490	100	4.9	2540	100	25.4
Landscape Regulations	F	.8	0	0	---	137	50	2.7	137	50	2.7
Public Education	G, H	---	0	0	---	0	150	---	0	150	---
District Activities	I, J, K, L	---	0	0	---	0	70	---	0	70	---
TOTAL		18.1	6321	100	63.2	3071	1220	2.5	9392	1320	7.1

meets EBMUD criteria. A rebate will also be given to other existing customers based upon $300 per 5,000 square feet with a monetary limit of $5,000 per development.

A single family homeowner who landscapes his front and backyard and who meets EBMUD criteria will receive a $300 rebate. If just one yard (the front or back) is to be landscaped and the customer meets the criteria, then a $150 cash rebate will be given.

Implementation — An EBMUD landscape technician will meet with the customer upon application for the rebate program to explain the program in further detail and determine the current status of the applicant's landscape. The landscape technician will then fill out a form specifying the qualifying criteria. Upon installation of a water conserving landscape the customer will contact the EBMUD representative for a followup inspection. After approval the customer will receive the pre-determined rebate check.

SYSTEM CAPACITY CHARGE (SCC) DISCOUNT

Purpose — The purpose of offering discounts on the SCC paid by all applicants for water service is to provide an incentive to install ultra-low flow showerheads and toilets.

Approach — Applicants who install ultra-low flow fixtures will be given a discount based on a present schedule.

Implementation — An applicant for an SCC discount will be eligible upon meeting established criteria. An EBMUD representative will review the applicant's plans and inspect the completed project before the discount is granted. Records will be maintained to determine water savings and program cost-effectiveness.

LANDSCAPE WATER USE EFFICIENCY IN NEW DEVELOPMENTS

Purpose — The purpose of this program element is to require or encourage landscape water use efficiency at properties where new water service is granted to residential, commercial, institutional (including public agencies), and industrial customers.

Approach — Landscape water use efficiency can be achieved through either a regulatory or incentive approach, which will be determined in the process of developing the implementation details for the water conservation program.

In the regulatory approach, landscaping would have to conform to minimum requirements that include:

- Type of plant material
- Turf area limitations
- Efficient irrigation systems

In the incentive approach a SCC discount or a rebate would be offered for installing water-conserving landscapes that meet District criteria.

Implementation — In the regulatory approach the District will cooperate with both Alameda and Contra Costa Counties who will act as the lead agencies in contacting cities to establish ordinances as required. The concept will be developed on an individual city-county basis. Some cities may not wish to adopt landscape efficiency requirements. That concept will be reviewed by EBMUD to determine whether it is practical and reasonable and whether EBMUD should instead adopt and enforce a uniform, District-wide regulation. Therefore, EBMUD should be prepared to allow staff time for the review and enforcement of these requirements.

In the incentive approach, the implementation of either an SCC discount or a rebate program would be similar to the discussions above under Landscape Rebate (for existing customers) and SCC Discount (for inside fixtures).

The projected water savings given in Tables VI-7 and VI-12 and the benefit/cost summary in Figure VI-8 are based on the regulatory approach for all but single family developments. Single family water savings are based on a landscape rebate program. The water savings will be more if a uniform regulatory approach is used and less if a uniform incentive approach is used.

Projected Water Savings from Proposed Program Elements Table VI-12

CATEGORICAL USERS	2005 Proj. Water Demand (MGD)	Water Audits Est. Water Savings (MGD)	Device Distribution Est. Water Savings (MGD)	Incentives Rebate/SCC Est. Water Savings (MGD)	Landscape Regulations Est. Water Savings (MGD)	Total Savings (MGD)
EXISTING CUSTOMERS						
Inside Use						
Single Family	47	--	2.6	--	--	
Multi-Family	21	1.7	2.6	--	--	
Commercial & Institutional	23	1.5	0.1	--	--	
Industrial	31	1.0	--	--	--	
Park, Golf & Cemetery	1	--	--	--	--	
Outside Use						
Single Family	36	--	--	1.9	--	
Multi-Family	8	0.4	--	0.4	--	
Commercial & Institutional	6	0.3	--	0.3	--	
Industrial	2	0.1	--	--	--	
Park, Golf & Cemetery	10	0.4	--	--	--	
TOTALS	185	5.4	5.3	2.6	0.0	13.3 (7.2%)
NEW CUSTOMERS						
Inside Use						
Single Family	16	--	--	2.0	--	
Multi-Family	3	--	--	0.4	--	
Commercial & Institutional	5	--	--	0.3	--	
Industrial	3	--	--	0.1	--	
Park, Golf & Cemetery	0	--	--	--	--	
Outside Use						
Single Family	12	--	--	0.9	--	
Multi-Family	1	--	--	0.2	--	
Commercial & Institutional	1	--	--	0.1	0.4	
Industrial	0	--	--	--	--	
Park, Golf & Cemetery	2	--	--	--	0.4	
TOTALS	43	0.0	0.0	4.0	0.8	4.8 (11.2%)
GRAND TOTALS	228	5.4	5.3	6.6	0.8	18.1 (7.9%)

PUBLIC INFORMATION

Purpose — The purpose of public infor ma-tion programs is to support and promote the water conservation effort by demonstrating the methods to conserve water and the benefits associated with efficient water use.

Approach — Public information programs which serve the above mentioned purpose are:

- Demonstration gardens
- Booklets and brochures on low water using landscapes
- Exhibits
- Welcome package
- Telephone hotline
- Water bill use comparison
- Landscape conference
- Tag water conserving plants
- Irrigation guidelines
- Awards to customers
- Landscape videotape

Implementation

- Landscape efficiency will be demonstrated through the discount connection fee program at model home sites. (see discount connection fee discussion).
- Booklets and brochures on low water using landscapes will be developed and distributed through EBMUD business offices, at exhibits, and through city and county agencies.
- Additional EBMUD water conservation exhibits are in the process of being developed for use at public events, and a water conservation activity center was opened at the District's Alamo Business Office in September 1985.
- A welcome package for new EBMUD customers will be developed and will explain the water conservation program.
- A telephone hotline will be established to answer questions relating to water conservation such as water audits, landscape consultation and rebates, etc.
- A water bill use comparison is being developed to allow customers to compare water use in gal/day to the same month of the previous year.
- Landscape conferences will be held in cooperation with other Bay Area water agencies to promote low water using landscapes among landscape professionals.
- Water conserving plants will be tagged by wholesale nurseries to assist customers in recognizing drought tolerant plant material. EBMUD will work with Bay Area wholesale nurseries and volunteer groups in the tagging program.
- Irrigation guidelines (frequency and amount) will be developed for turf grasses based upon evapotranspiration (ET) rates. A weather station will be used to monitor ET rates and will be connected to a statewide weather network computer system. The information will be used to assist customers with their irrigation practices.
- An annual awards ceremony will be held by EBMUD to recognize those businesses that continue to increase water use efficiency. This will further promote conservation efforts.
- A 20-25 minute videotape on water conserving landscapes will be made available to EBMUD customers through EBMUD business offices, retail nurseries, and video rental stores.

SCHOOL EDUCATION

Purpose — The purpose of school education activities is to increase the promotion of wise water use habits at the elementary school level and to teach water awareness and expand appreciation for water as a limited natural resource at the high school level.

Approach — EBMUD is currently conducting a successful elementary school water education program and will evaluate this program annually. EBMUD, in cooperation with the State of California and other water agencies plans to develop high school water education reading material.

EBMUD will also cooperate with these agencies to develop computer software water education material. Currently, approximately 20 percent of high school students in the service area receive computer training and this figure is expected to reach 50 percent in five years. Thus, the computer water education material will be used to

complement and enhance the high school reading material program.

Implementation — EBMUD will work with the State and other water agencies and associations in the development of school education material.

SUPPORT ACTIVITIES

Purpose — The purpose of support activities is to supplement the other water conservation program activities to ensure their successful implementation.

Approach — Develop a landscape advisory committee to support such water conservation programs as a landscape conference, review landscape technical information, assist in developing the landscape consultation and rebate program, and review landscape efficiency in new development programs.

The support of volunteer groups will be sought to assist in such water conservation programs as tagging low-water using plants at wholesale nurseries and to assist in a kit distribution program.

Implementation — EBMUD will form a landscape technical advisory committee from community landscape professionals and horticulturalists.

DISTRICT WATER USE ACTIVITIES

Purpose — The purpose of District water use activities is to insure efficient water use at EBMUD facilities.

Approach — Review landscape projects to insure efficient water use. Also review existing landscapes, and where irrigation efficiency can be improved by installing low water using plants and irrigation systems.

Implementation — EBMUD will establish a program for landscaping plan review and retrofitting at EBMUD facilities.

WATER PRICING STUDY

Purpose — The purpose of a water pricing study is to consider modifying the water rate structure as a means of increasing water use efficiency.

Approach — Evaluate the possibility of water conservation rate structures including a seasonal rate structure. Discussion of rate structures is in Chapter V.

Implementation — EBMUD will continue to investigate water conserving rate structures.

PRESSURE REDUCTION STUDY

Purpose — The purpose of a pressure reduction study is to identify areas of high water pressure (greater than 80 psi) and investigate the feasibility of a pressure reduction program.

Approach — Identify areas where high water pressure could be reduced without adversely affecting fire fighting capabilities and service to customers. Also, investigate changes in design standards to avoid high water pressure in new developments.

Implementation — EBMUD will identify areas of existing high pressure and investigate the feasibility and impacts of pressure reduction measures.

Supply Management Programs

In addition to the demand management activities above, EBMUD will continue efforts in reclamation and leak detection as previously described in Chapter V. Reclamation projects currently provide approximately 5 MGD of reclaimed water and wastewater. Several other projects are under study and will be implemented if found to be technically and financially feasible. Costs associated with reclamation projects are expected to rise from the current $106,000 to $327,000 per year.

EBMUD's leak detection program is aimed at reducing unaccounted-for losses by minimizing leaks within the distribution system. Through an aggressive program of leak detection and pipe replacement the District has reduced its unaccounted-for water significantly using advanced leak detection equipment to survey approximately 1,700 miles of pipe each year. The cost of the leak detection program is $715,000 per year.

IMPLEMENTATION OF THE PROPOSED PROGRAM

Table VI-13 shows the proposed budget required to implement the water conservation plan. Eight persons are required to implement the proposed program, as shown in Table VI-14.

The implementation schedule is shown on Figure VI-9. The water conservation program will be implemented within one year; the most cost-effective programs will be implemented first. Figure VI-10 shows how the water conservation program will be evaluated. In order to monitor various elements of the program, records will be maintained so that follow-up surveys can be conducted to quantify and verify results.

Expanded Water Conservation Program Budget

Table VI-13

PROGRAM ELEMENT	LABOR	MATERIALS	COST
1 Water Saving Device Distribution	30,000	120,000	150,000
2 Water Audits Residential	40,000	10,000	50,000
3 Water Audits (C & I)	40,000	10,000	50,000
4 landscape Incentives	100,000	500,000	600,000
5 SCC Discount	100,000	0	100,000
6 Landscape Incentives	50,000	0	50,000
7 Public Education	25,000	125,000	150,000
8 District Activities	60,000	10,000	70,000
TOTAL	445,000	775,000	1,220,000

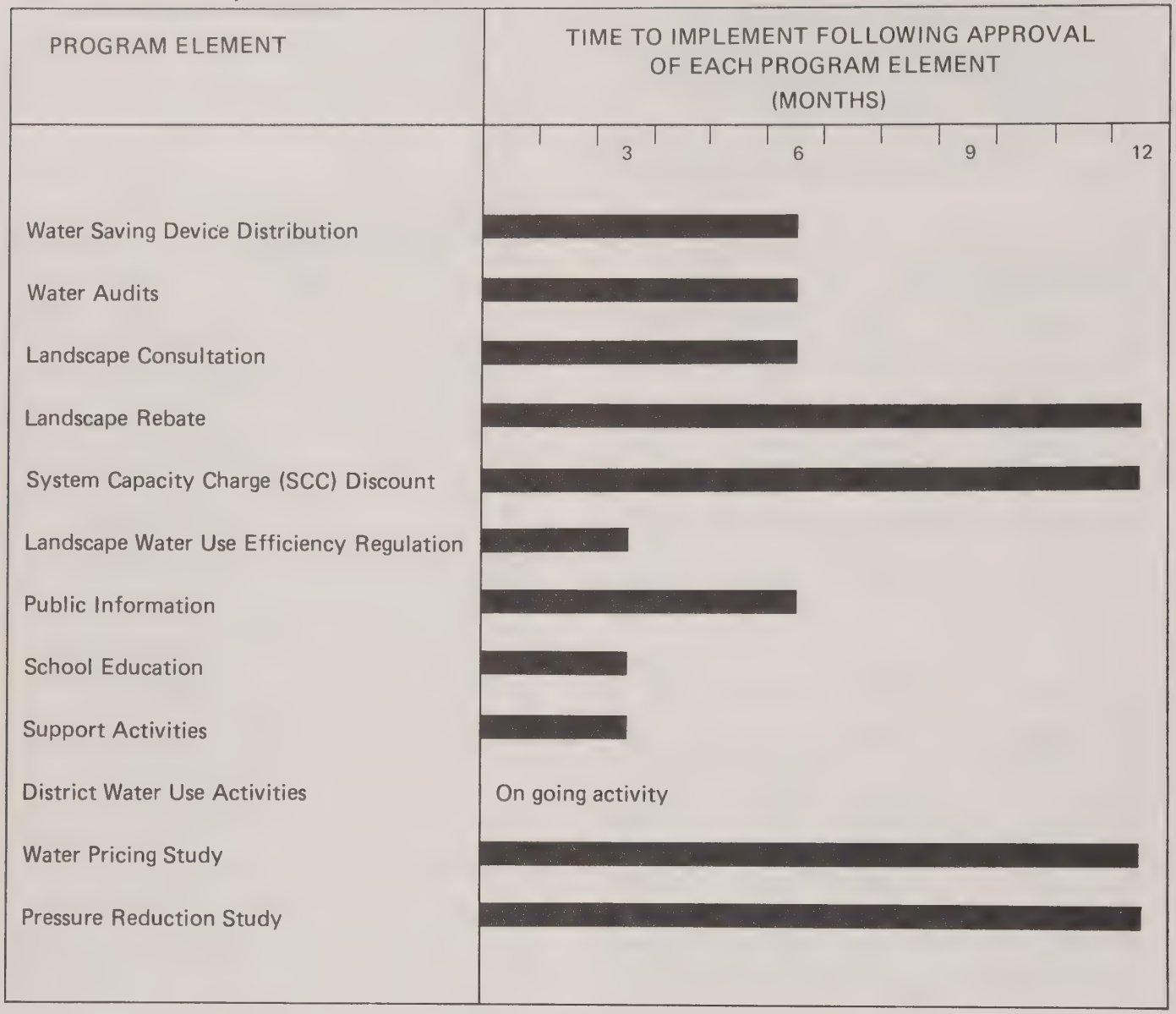
Water Conservation Program Staff Requirements

Table VI-14

PERSONNEL	STAFFING NUMBER	DUTIES
Administrator	1	Manages program, supervises staff
Water Audit Representative	2	Conducts residential, industrial, commercial and institutional water audits. Distributes water saving devices.
Landscape Architect	1	Visits customer sites and makes landscaping recommendations
Landscape Technician	1	Inspects landscapes to determine if customers have met qualifications for rebate
Public Information Officer	½	Conducts public education part of water conservation program
Secretary	1	Maintains files, directs customer inquiries on water conservation audits, consultations and performs other secretarial duties.
Field Inspector	2	Conducts necessary field inspections in new construction to determine SCC discount eligibility

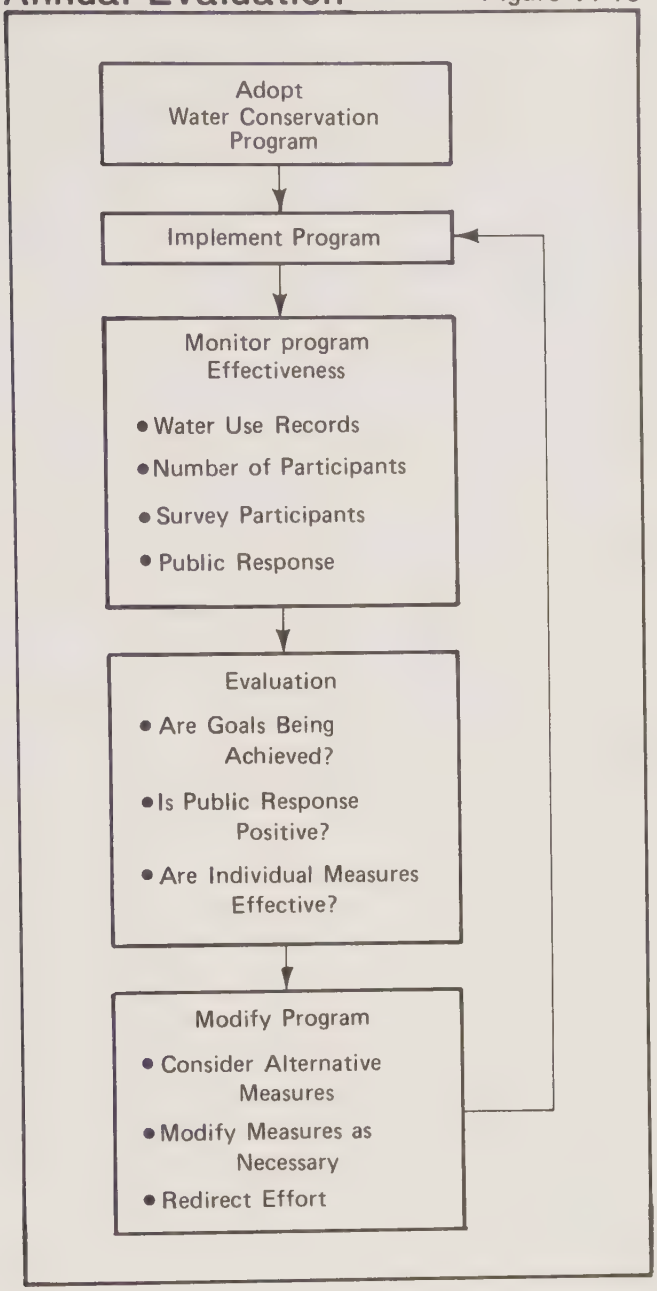
Water Conservation Program
Schedule of Implementation

Figure VI-9



Water Conservation Program Annual Evaluation

Figure VI-10



Appendix A
Urban Water Management Planning Act

Assembly Bill No. 797

CHAPTER 1009

An act to add and repeal Part 2.6 (commencing with Section 10610) to Division 6 of the Water Code, relating to water conservation.

[Approved by Governor September 21, 1983. Filed with Secretary of State September 22, 1983.]

LEGISLATIVE COUNSEL'S DIGEST

AB 797, Klehs. Water: management planning.

(1) Under existing law, local water suppliers may, but are not required to, adopt and enforce water conservation plans.

This bill would require every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to prepare and adopt, in accordance with prescribed requirements, an urban water management plan containing prescribed elements. The bill would require the plan to be filed with the Department of Water Resources, and would require the department to annually prepare and submit to the Legislature a report summarizing the status of the plans. The bill would require each supplier to periodically review its plan in accordance with prescribed requirements, would specify requirements for actions or proceedings arising under the bill, and would specify related matters.

The bill would make legislative findings and declarations in this connection.

The provisions of the bill would remain in effect only until January 1, 1991.

(2) Article XIII B of the California Constitution and Sections 2231 and 2234 of the Revenue and Taxation Code require the state to reimburse local agencies and school districts for certain costs mandated by the state. Other provisions require the Department of Finance to review statutes disclaiming these costs and provide, in certain cases, for making claims to the State Board of Control for reimbursement.

This bill would impose a state-mandated local program as its requirements would be applicable to local public agencies.

However, the bill would provide that no appropriation is made and no reimbursement is required by this act for a specified reason.

The people of the State of California do enact as follows:

SECTION 1. Part 2.6 (commencing with Section 10610) is added to Division 6 of the Water Code, to read:

PART 2.6. URBAN WATER MANAGEMENT PLANNING

CHAPTER 1. GENERAL DECLARATION AND POLICY

10610. This part shall be known and may be cited as the "Urban Water Management Planning Act."

10610.2. The Legislature finds and declares as follows:

(a) The waters of the state are a limited and renewable resource subject to ever increasing demands.

(b) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The conservation and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The conservation and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to achieve conservation and efficient use.

CHAPTER 2. DEFINITIONS

10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

10611.5. "Conservation" means those measures that limit the amount of water used only to that which is reasonably necessary for the beneficial use to be served.

10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate reasonable and practical efficient uses and conservation activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for

implementation shall be included in the plan.

10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

10617. "Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 7 (commencing with Section 4010) of Part 1 of Division 5 of the Health and Safety Code.

Chapter 3. Urban Water Management Plans

Article 1. General Provisions

10620. (a) Every urban water supplier serving water directly to customers shall, not later than December 31, 1985, prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier after December 31, 1984, shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water to customers may adopt an urban water management plan or participate in areawide, regional, watershed, or basinwide urban water management planning; provided, however, an urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation and efficient water use.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

10621. Each urban water supplier shall periodically review its plan at least once every five years. After the review, it shall make any amendments or changes to its plan which are indicated by the review. Amendments or changes in its plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

Article 2. Contents of Plans

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

10631. A plan shall include all of the following elements:

(a) Contain an estimate of past, current, and projected water use and, to the extent records are available, segregate those uses between residential, industrial, commercial, and governmental uses.

(b) Identify conservation measures currently adopted and being practiced.

(c) Describe alternative conservation measures, if any, which would improve the efficiency of water use with an evaluation of their costs and their environmental and other significant impacts.

(d) Provide a schedule of implementation for proposed actions as indicated by the plan.

(e) Describe the frequency and magnitude of supply deficiencies, including conditions of drought and emergency, and the ability to meet short-term deficiencies.

10632. In addition to the elements required pursuant to Section 10631, a plan projecting a future use which indicates a need for expanded or additional water supplies shall contain an evaluation of the following:

(a) Waste water reclamation.

(b) Exchanges or transfer of water on a short-term or long-term basis.

(c) Management of water system pressures and peak demands.

(d) Incentives to alter water use practices, including fixture and appliance retrofit programs.

(e) Public information and educational programs to promote wise use and eliminate waste.

(f) Changes in pricing, rate structures, and regulations.

10633. The plan shall contain an evaluation of the alternative water management practices identified in Sections 10631 and 10632, taking into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

Evaluation of the elements in Section 10632 shall include a comparison of the estimated cost of alternative water management practices with the incremental costs of expanded or additional water supplies, and in the course of the evaluation first consideration shall be given to water management practices, or combination of practices, which offer lower incremental costs than expanded or additional water supplies, considering all the preceding evaluation factors.

Article 3. Adoption and Implementation of Plans

10640. Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630).

The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

10641. (a) An urban water supplier required to prepare a plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water conservation and management methods and techniques.

(b) In order to assist urban water suppliers in obtaining needed expertise as provided for in subdivision (a), the department, upon request of an urban water supplier, shall provide the supplier with a list of persons or agencies having expertise or experience in the development of water management plans.

10642. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644. An urban water supplier shall file with the department a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be filed with the department within 30 days after adoption.

The department shall annually prepare and submit to the Legislature a report summarizing the status of the plans adopted pursuant to this part.

CHAPTER 4. MISCELLANEOUS PROVISIONS

10650. Any actions or proceedings to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan shall be commenced within 18 months after that adoption is required by this part, or within 18 months after commencement of urban water service by a supplier commencing that service after January 1, 1984.

(b) Any action or proceeding alleging that a plan, or action taken pursuant to the plan, does not comply with this part shall be commenced within 90 days after filing of the plan or amendment thereto pursuant to Section 10644 or the taking of that action.

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan, or an action taken pursuant to the plan by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

10652. The California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) does not apply to the preparation and adoption of plans prepared and adopted under this part. Nothing in this part shall be interpreted as exempting projects for implementation of the plan or for expanded or additional water supplies from the provisions of the California Environmental Quality Act.

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the State Water Resources Control Board, for the preparation of water management plans or conservation plans; provided, that if the State Water Resources Control Board requires additional information concerning water conservation to implement its existing authority, nothing in this part shall be deemed to limit the board in obtaining that information. The requirements of this part shall be satisfied by any water conservation plan prepared to meet federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing water management or conservation plan which includes the contents of a plan required under this part.

10654. All costs incurred by an urban water supplier in developing or implementing its plan shall be borne by it unless otherwise provided for by statute.

10655. If any provision of this part or the application thereof to any person or circumstances is held invalid, that invalidity shall not affect other provisions or applications of this part which can be given effect without the invalid provision or application thereof, and to this end the provisions of this part are severable.

10656. This part shall remain in effect only until January 1, 1991, and as of that date is repealed, unless a later enacted statute, which is chaptered before January 1, 1991, deletes or extends that date.

SEC. 2. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the local agency or school district has the authority to levy service charges, fees, or assessments sufficient to pay for the program or level of service mandated by this act.

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Appendix B
Comments and Responses

This appendix contains a summary of the comments received on the Draft Urban Water Management Plan followed by a response. In some instances the Plan has been modified as a result of comments, in these instances reference is made to the change in the Plan. Comments and responses have been grouped into the following categories:

- Demand Projections
- Water Availability
- Drought Management Measures
- Supply Management Measures
- Reclamation
- Water Conservation Program
- Pricing
- Other Comments

A list of other agencies, interested organizations, and individuals submitting comments on the Draft Plan is included at the end of this appendix.

DEMAND PROJECTIONS

Comment: The projections for water demand appear to be based upon ABAG's projections for growth. It is then assumed, without explanation, that ABAG's data would be the "upperbound or high projection" and then used a low projection which assumes slower growth. Discussions with ABAG suggest that they may have underestimated growth in the Tri-Valley area. Other studies also suggest growth may be greater than that forecast by ABAG for the Tri-Valley area. It would therefore be more appropriate to use ABAG's projections as a mid-range projection and consider the possibility of growth occurring at a higher rate. Since the upperbound growth projections may be too conservative, the water demand projections may also be low.

Response: The Draft Plan states (on p. III-10) that ABAG has indicated that Projections '83 would represent the upperbound of a forecast range. EBMUD recognized that Projections '83 did not adequately portray growth in the San Ramon Valley area. The San Ramon Valley area was covered by a special EBMUD study in 1984 for the Environmental Impact Report prepared for the major facilities projects in the distribution system. In that study, specific recent development activity in the area was identified which were not accounted for in ABAG's Projections '83. This development activity has been incorporated in EBMUD's water demand projections.

Recently, ABAG released Projections '85 which includes housing, population, and employment projections from 1980 to 2005. These projections suggest higher growth than Projections '83 and include recent development activity. The differences between Projections '85 and Projections '83 have been incorporated into the Final Plan. Figure III-7 on page III-9 shows the total two-county population projections from the ABAG projections.

Comment: The area west of San Ramon should be included in the discussion of potential future development areas outside the ultimate boundary.

Response: EBMUD has identified other areas outside the ultimate service boundary that may request water service in the future. Potential future water demands from these areas are unknown at this time, however, additional areas are identified in Chapter III.

Comment: What does the District intend to do about potential future water demands identified outside the ultimate boundary?

Response: EBMUD's water supply planning is limited to service within the ultimate boundary. The District will consider requests for water service or replacement supply outside the ultimate boundary on a case-by-case basis and in accordance with the District's established policies and procedures.

WATER AVAILABILITY

Comment: What will be done with the water saved? The water saved cannot be used to serve new growth. Recommend that additional growth not be served until EBMUD secures an additional water supply.

Response: The projected growth that would have to be served within the District's ultimate boundary is not changed by the expanded water conservation program. The reduction in future water demand would make it easier and more economical to serve existing customers and the projected growth. The need to use the supplemental water supply would be reduced. These factors are reflected in the objectives stated for the expanded water conservation program (Chapter VI). Water service for additional growth after demand reaches acceptable maximum level of demand is governed by the Board's policy on Water Supply Availability and Deficiency (Chapter IV).

Comment: With an increase in water conservation it will be more difficult to reduce demand in time of drought. Recommend that the reduced consumption be coupled with a reduction in the acceptable maximum level of demand. The amount of additional lead time provided, before additional supplies are needed, by the expanded water conservation program may not be 10 years.

Response: Under current conditions the acceptable level of demand is 240 MGD. That figure will be reviewed each year in the Water Availability Report. As time passes, the acceptable maximum level of demand will probably decrease for two reasons. First, as greater water use efficiency is achieved through the water conservation program it will become more difficult to achieve the water use reductions achieved during the 1976-77 drought. Second, increasing demands on the Mokelumne River and increasing channel losses below Camanche Reservoir will decrease supplies available to EBMUD. The water expanded conservation program may provide some additional lead time for implementing a supplemental supply but will not preclude its eventual need.

Comment: To the extent that the Plan assumes that American River water flowing through the Folsom South Canal will be available for distribution to the EBMUD service area, or to the Contra Costa Water District service area, the Plan is faulty and needs substantial revision.

Response: The Urban Water Management Plan does not address the issue of where or how the District will obtain additional water supplies but identifies its eventual need. EBMUD's Water Action Plan and accompanying EIR, scheduled for completion in 1986, will evaluate various alternatives to meet the District's future water supply needs.

Comment: Continuing to allow new customers without fully developing existing water resources (such as the American River) places financial burden on current customers to fund water sources for new customers. Any annexations and/or connections should be required to fund new supply sources in total.

Response: EBMUD is in the process of establishing a fund to be used to assist in the financing of measures to increase the available water supply. This fund may be used to implement water conservation measures or to develop wastewater reuse projects or water supply improvements. Revenue for the fund may be from annexation fees and/or an additional component in the System Capacity Charge paid by all applicants for water service.

Comment: The terminal reservoirs could be expanded and, if coupled with supply from the American River, could provide greater drought management. Further development of the terminal reservoirs would be more preferable as a drought management policy than water rationing.

Response: Expansion of the terminal reservoirs could provide additional storage capacity for 1) increased standby storage in the event of a drought or supply interruption; and 2) increased reregulation capacity for imported water supplies. EBMUD's Water Action Plan will consider expansion of the terminal reservoirs as part of the District's long-term water supply strategy. Such an evaluation is beyond the scope of the Urban Water Management Plan.

Comment: The Plan does not make significant reference to the proposed Pinole Reservoir and how it fits into the long-range planning of the District. The development of Pinole Reservoir could have a significant impact on land use in that area. Also, development of this reservoir could imply heavier reliance for West Contra Costa County on lower quality water from the reservoir. Due consideration should be given to assure that water quality is not diminished.

Response: Evaluation of Pinole Reservoir will be included in the Water Action Plan.

DROUGHT MANAGEMENT MEASURES

Comment: The Plan needs clearer definition of what triggers drought water conservation emergency measures. Triggers should be in terms of runoff, stored water, and annual demand.

Response: A procedure is being developed to supplement the District's Water Supply Availability and Deficiency Policy, which will define the specific water supply conditions that would identify a drought situation as part of the annual Water Availability Report. Based upon the forecast of deficiencies for the immediate year and the assumed runoff for the following year, the reduction necessary and the actions required to bring about those reductions would be considered by the Board of Directors.

Comment: Regarding short-term drought measures, recommend stringent measures be adopted now for immediate implementation when the situation arises. Measures should be based on experiences of EBMUD and other water agencies in the 1976-77 drought. Consideration should be given to increased efficiencies in water use due to water conservation.

Response: In the event that the annual Water Availability Report identifies potential deficiencies to occur in either the immediate or following year, then appropriate demand management measures would be implemented. Specific recommendations would depend on many factors including current water storage, anticipated runoff, level of current demand, effectiveness of existing conservation measures, and the public's awareness and perception of the problem. Details of specific measures cannot be adequately defined prior to a drought because the response would vary depending on actual circumstances present when a drought occurs. Table IV-2 on page IV-12 shows a list of potential demand reducing measures that could be considered for implementation.

Comment: The Plan suggests that prohibiting new annexations and prohibiting new connections were implemented and thus contributed to the 39 percent reduction in water use achieved in 1977. To the contrary, there was not a prohibition on new connections, and while annexations may have been postponed, they were not prohibited. Both prohibition proposals are extreme, portend serious economic and social hardships, and would not offer any significant demand reduction in the District.

Response: It is correct that new connections were not prohibited in 1977. It is listed in the UWMP as the final measure that may have to be considered to achieve a significant reduction in demand in a future drought situation. Applications for annexations were not accepted by EBMUD during the water supply emergency in 1977, which is considered a prohibition on annexations for that period.

Comment: EBMUD should prohibit both new connections and annexations at the first indication of a shortage in lieu of waiting until a 25 percent reduction is needed. A rate increase should only be implemented during mandatory rationing only after all annexations and new connections have been prohibited and should be rolled back prior to allowing new connections and annexations.

Response: For a water supply emergency like 1977, prohibiting new connections and annexations would not have the same immediate effect and would not offset the need for a rate increase. The rate increase in 1977 was necessary because EBMUD's operating costs are largely fixed and had to be covered by a smaller volume of water sold.

Comment: The Plan does not seem to take into consideration that during periods of drought, areas of different climatic characteristics will have different demands for domestic water. The Plan rations the same amount of water to a family in an apartment residential zone (multi-family) as a family living in a detached single-family residence. This does not take into account the fact that the different residential settings will have a different demand for domestic water.

Response: The Plan identifies the overall reduction in demand within the EBMUD service area. The distribution of that reduction by area and by category of customer would be determined at the time of water supply emergency depending on the actual circumstances in the service area. In 1977, it was recognized that different categories of customers have different water use patterns and the rationing program was designed accordingly. For example, water use by single-family residential customers decreased nearly 50 percent in 1977 as compared to 1975 (see Table III-2 on page III-7) while multi-family residential customers water use decreased by about 20 percent.

SUPPLY MANAGEMENT MEASURES

Comment: Why the reduction in pipe replacements in recent years?

Response: A major effort to catch up with pipe replacements occurred during the 1960's. This effort has tapered to an average rate averaging about 7.5 miles per year, which is determined to be consistent with the age and condition of pipelines in the distribution system.

Comment: As noted in the Plan, the change from flat rate to metered usage of water tends to reduce demand. A reasonable corollary would be that a change from master metered to single meter usage in multi-unit dwellings would likewise reduce water demand. Is this a practical objective?

Response: Master meters are permitted for multi-family dwelling units only when the area around the structures is in single ownership and there is a single customer such as a homeowners association for a condominium complex or the owner of rental units. Proposed changes in the system capacity charges for new service connections, which are currently being considered, would put multi-family units on a charge per unit basis, regardless of metering arrangement. This would reduce the current incentive to install master meters.

RECLAMATION

Comment: Will reclaimed wastewater from Dublin-San Ramon Services District be used in Blackhawk? List the golf courses by name that are participating in the study.

Response: Several potential reclaimed water users have been identified in the study of the San Ramon Valley Reclamation Project. These potential users include:

- Blackhawk Corporation
  - — Blackhawk golf courses
  - — Canyon Lakes Golf Course
- California Department of Transportation
  - — Interstate 680 landscaping
- Crow Canyon Country Club
  - — Golf Course
- City of Danville
  - — Osage Station Park
- Dublin-San Ramon Services District
  - — Dublin Sports Grounds
  - — Boone Acres Park
  - — Athan Downs Park
- San Ramon Valley Unified School District
  - — Baldwin Elementary School
  - — California High School
  - — Country Club Elementary School
  - — Greenbrook Elementary School
  - — Montevideo Elementary School
  - — Neil Armstrong Elementary School
  - — Pine Valley Intermediate School
  - — Walt Disney Elementary School

WATER CONSERVATION PROGRAM

Comment: Customers are not treated the same. Residential customers get a rebate, others are regulated. Need a consistent philosophical approach. Landscape regulations for new developments should be applied to single-family dwellings.

> **Response:** The Final Plan has been revised to reflect a consistent approach to landscape water use efficiency. It is recommended that all existing customers meeting District criteria (yet to be defined) receive a rebate for installing water efficient landscapes. Landscaping for all properties granted new water service connections would either be regulated by cities and counties or by the District or would be eligible for a SCC discount or a rebate through an incentive program. The selection of the approach for new water service connections will be made in the process of developing the implementation details for the program.

Comment: Initial emphasis of the conservation program could be placed on supply management actions such as leak detection and pressure reduction. The results of these actions are less difficult to predict than those requiring predictions of customer behavior, and they would demonstrate the District's long-term commitment to water conservation.

> **Response:** Leak detection has been an effective, ongoing program at EBMUD for many years. Pressure reduction within the distribution system will be studied as part of the expanded water conservation program. However, its application may be limited because of the characteristics of the distribution system, the wide range of elevations that must be served, and the need to maintain adequate pressure and flow for fire fighting.

Comment: Nothing in the Plan discusses making demands on other governmental agencies to institute conservation measures for their own water use.

> **Response:** Other governmental agencies are included in the "institutional" category of customers described in the Plan. Thus, those agencies are included in the expanded water conservation program.

Comment: Evaluation standards should be incorporated into every stage of the conservation program and include data collection efforts such as meter reading. The integration of evaluation requirements and data collections in the program design will be particularly useful if demand and supply management resources are to be compared for cost-effectiveness in a side-by-side analysis.

> **Response:** As described in the Plan, annual evaluation is an important part of the expanded water conservation program. EBMUD routinely maintains records and monitors water use by customer, customer category, and area through its computer-based Water Consumption Information System.

Comment: EBMUD should write and enforce the Landscape Regulations itself. Enforcement should be based both on main extension agreements and on individual service connections, or by other means that are appropriate. Regulations could impose a substantial burden on the available staff of local jurisdictions.

> **Response:** It may be necessary for EBMUD to adopt and enforce the landscape regulations. In developing the implementation details following adoption of the Plan, the concept of city/county ordinances will be reviewed to determine whether it is practical and reasonable and whether EBMUD should instead adopt and enforce a uniform, District-wide regulation.

Comment: The implementation language in the proposed regulation states that EBMUD may be required to enforce landscape efficiency through main extension agreements in cities (or counties) that do not adopt their own requirements. This is truly a "Catch 22" situation. How do you suggest an applicant proceed given a conflict between a local agency's requirements and EBMUD's mandates.

Response: A telephone survey of 22 cities and two counties conducted by the District approximately 12 months ago indicated that although many agencies had general landscape guidelines or requirements for minimum areas to be landscaped, no contacted agency had requirements for specific plant material or type of irrigation system. Although some agencies at that time were recommending low-water-using plant material, it was not a requirement. The District, therefore, in proposing landscape efficiency requirements does not see a conflict with existing city and county landscape requirements. The matter will be reviewed with the cities and counties again before such a measure is implemented.

Comment: Contra Costa County has been working closely with EBMUD and the Contra Costa Water District in developing water conservation landscaping policies for new developments. When the final Plan is published, EBMUD should note that Contra Costa County has developed water conservation landscaping regulations for new developments in unincorporated areas.

Response: That note has been added to the Plan in Chapter VI.

Comment: The proposal to regulate landscaping installation in the types of developments listed is both discriminatory and extreme. Rather than mandate requirements such as these to achieve water conservation, the District should encourage and promote voluntary actions through means proposed in the Draft Plan, such as landscape consultation, landscape rebate, and SCC discount.

Response: Regulations provide the most effective reduction in water use provided that the implementation and enforcement are practical to achieve.

Comment: The Retrofit on Resale measure would be difficult and costly to enforce.

Response: Agreed. This measure has not been included in the expanded Water Conservation Program.

Comment: Single-family dwelling units should be included in the water audits program.

Response: They are included in the Final Plan.

Comment: The school education program should be scrapped. Only a rare few concerned students would listen to presentations. Such an effort would be a waste of classroom time and District funding.

Response: Education of children in all subjects is not limited to the few students who may be concerned about the subjects. The purpose is to stimulate awareness and a concern about a limited resource along with the other meaningful subjects being taught.

PRICING

Comment: The Water Pricing Study should be made a top priority. Alternatives to consider include an inclining rate block structure and a seasonal rate structure. The Plan should include a seasonal rate structure to encourage conservation.

> **Response:** The water pricing study will consider all possible alternatives for modifying the rate structure as a means of increasing water use efficiency.

Comment: EBMUD should explore ways to reduce sewer charges in proportion to reduced water use.

> **Response:** EBMUD sewage charges for the Special District One service area do consider water use.

OTHER COMMENTS

Comment: Since controlling large building fires frequently requires very large water flows for extended durations, EBMUD should encourage adoption of automatic sprinklers for fire protection. The current Fire Service meter charge acts as a disincentive for installation of such systems. To further encourage use of automatic sprinkler systems, you might consider offering property owners a discounted water rate for these systems.

> **Response:** This is an issue related to the design of the distribution system and the rates and charges for fire service connections. It does not affect the Urban Water Management Plan.

Comment: Development of fuel breaks and/or wildland clearing on EBMUD watersheds would reduce the potential for large uncontrolled wildland fires and subsequent Fire Department water use.

> **Response:** EBMUD currently has an active watershed management program which includes wildland clearing using goats and other means. These activities reduce the risk of uncontrolled fires, protect wildlife habitates, control the spread of pests, and help maintain water quality.

LIST OF OTHER AGENCIES, INTERESTED ORGANIZATIONS, AND INDIVIDUALS SUBMITTING COMMENTS ON DRAFT URBAN WATER MANAGEMENT PLANT

LETTERS

City of El Cerrito, City Manager

City of Alameda, Planning Department

City of Oakland, Planning Department

City of Oakland, Fire Department

City of Pinole, City Manager

Town of Moraga, Deputy Town Manager

Contra Costa County, Community Development Department

San Francisco Bay Conservation and Development Commission

Building Industry Association of Northern California, Eastern Division

Save the American River Association

Pacific Gas and Electric Company

San Francisco Bay Chapter, Sierra Club

League of Women Voters of the Bay Area

Andrew Cohen, Energy and Resources Group, UC (two letters)

Jeffrey C. Wiedemann, Wiedemann Ranch, San Ramon

Charles Pinkerton, Windemere Ranch, Redwood City

Ms. Adele Shepherd, Berkeley

PUBLIC HEARING

Jean B. Siri, El Cerrito

Jo Nugent, League of Women Voters

Andrew Cohen, Berkeley

Appendix C
Resolution

Approved as to
Form & Legality

General Counsel

RESOLUTION NO. 31,449

ADOPTING AND DIRECTING FILING OF THE EAST BAY MUNICIPAL UTILITY DISTRICT URBAN WATER MANAGEMENT PLAN

Introduced by Director Simmons ; Seconded by Director Burke

WHEREAS the California Legislature enacted District-sponsored Assembly Bill No. 797, the Urban Water Management Planning Act, which mandates that every urban supplier of water providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre feet of water annually, prepare an Urban Water Management Plan, the primary objective of which is to provide planning for the conservation and efficient use of urban water supplies; and

WHEREAS AB 797 requires that said Plan be adopted by December 31, 1985, after public review and hearing, and filed with the Department of Water Resources within thirty days of adoption; and

WHEREAS the District is an urban supplier of water providing water to over one million customers and has, therefore, prepared and circulated for public review a Draft Urban Water Management Plan in compliance with the requirements of AB 797, and a properly noticed public hearing regarding said Draft Plan was held by the Board of Directors on October 29, 1985, and a Final Plan prepared;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the East Bay Municipal Utility District as follows:

1. The Urban Water Management Plan is hereby adopted and ordered filed with the Secretary;

2. The General Manager is hereby authorized and directed to file said Plan with the Department of Water Resources within 30 days after this date, in accordance with AB 797.

3. The General Manager is hereby authorized and directed to take steps necessary to begin implementation of the expanded Water Conservation Program as detailed in the adopted Urban Water Management Plan, including the development and recommendation to the Board of the necessary programs, procedures, rules and regulations to carry out an effective and equitable conservation program. Such steps will include additional consideration of appropriate measures for the improvement of the water use efficiency in all landscape areas.

ADOPTED this 26th day of November, 1985 by the following vote:

AYES: Directors Burke, Hill, Kofman, McLean, Simmons, Warren and President Skaggs.

NOES: None.

ABSENT: None.

ABSTAIN: None.

Sanford M. Skaggs
President

ATTEST:

Paula E. Malcom
Secretary